modern castings

JANUARY, 1956

Owned by THE MEN WHO BUY

Reserve Your Hotel Space!

Reservation form for 60th AFS Castings Congress and Show May 7-9 on Page 27

Common Sense in Quality Control

Bronze shops can give top quality and they needn't break their backs to do it

Workmen's Compensation

Good and bad points of proposed new model law are discussed by AFS experts

Safety: It's No Accident

There's a clue to successful program—it's keen interest by top management

Weighing Sand Electrically

Puget Sound installation uses strain gages for instant, accurate weighing

Furnace Melts Steel and Bronze

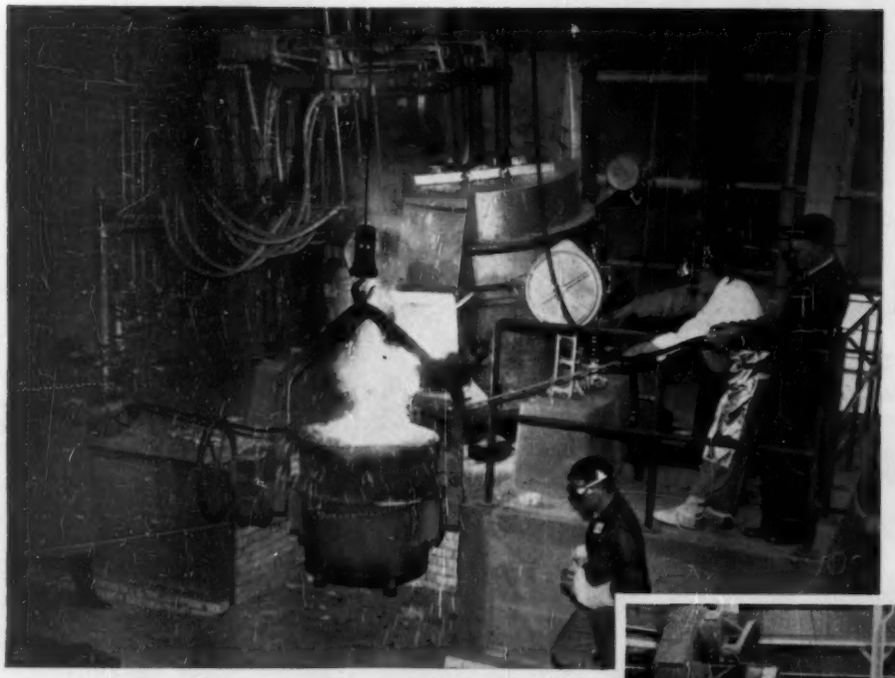
Canadian steel foundry uses direct arc furnace to make its own bronze castings

Do Sand Tests Give us the Facts?

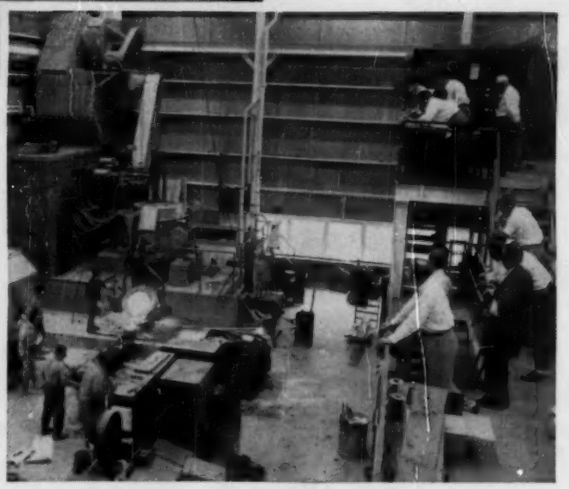
Molds made in the foundry don't behave as the book predicts. Here's a solution

Gray Iron Study

16-page special bonus section summarizes case study data on three small gray iron foundries



● Scientists, laboratory assistants and skilled operators work side by side to develop methods and materials at General Electric's new Metals and Ceramics Laboratory.



1-ton heats in this Lectromelt* furnace shorten the step from research to production

THIS Lectromelt Furnace is larger than you ordinarily see employed for research work. But General Electric's new laboratory was built "factory size" so that processes developed here could be transferred to production without the usual headaches. The 2,000-pound heats possible here are production runs in plenty of plants.

The high degree of accuracy with which temperatures and chemical make-up can be controlled in Lectromelt Furnaces makes them well suited to such research studies. Alloys and procedures developed on a pilot basis can then be duplicated day after day in other Lectromelt Furnaces, when they're turned over to the manufacturing department. Heats are uniform and quality is high.

Catalog No. 9-A describes Lectromelt Furnaces for melting and refining. For a copy, write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Penna.

Manufactured in...GERMANY: Friedrich Kocks GMBH, Dusseldorf...ENGLAND: Birlec, Ltd., Birmingham ...FRANCE: Stein et Roubaix, Paris ... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege ... SPAIN: General Electrica Espanola, Bilbao ... ITALY: Forni Stein, Genoa ... JAPAN: Daido Steel Co., Ltd., Nagoya.

*REG. T. M. U. S. PAT. OFF

MOORE RAPID

WHEN YOU MELT... *Lectromelt*

CIRCLE NO. 113, PAGE 69-70

future meetings and exhibits

JANUARY

20 . . Malleable Founders' Society, *Hotel Cleveland, Cleveland. General Society Meeting.*

23-26 . . Plant Maintenance & Engineering show, *Convention Hall, Philadelphia.*

FEBRUARY

6-9 . . Fifth Annual Industrial Ventilation Conference, *Kellogg Center, Michigan State University, East Lansing. Sponsored by the Michigan Department of Health and the MSU School of Engineering.*

9-10 . . Wisconsin Regional Foundry Conference, *Schroeder Hotel, Milwaukee. Sponsored by the AFS Wisconsin Chapter and the University of Wisconsin and the AFS Wisconsin Student Chapter.*

16-17 . . Southeastern Regional Foundry Conference, *Tutwiler Hotel, Birmingham, Ala. Sponsored by the Birmingham District and Tennessee Chapters and the University of Alabama Student Chapter of American Foundrymen's Society.*

24 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

27-Mar. 2 . . American Society for Testing Materials, *Statler Hotel, Buffalo. 1956 Committee Week.*

MARCH

2 . . Malleable Founders' Society, *Hotel Commodore, New York. Eastern Section Meeting.*

7-8 . . Foundry Educational Foundation, *Hotel Cleveland, Cleveland. College-Industry Conference.*

15-16 . . Steel Founders' Society of America, *Drake Hotel, Chicago. Annual Meeting.*

19-23 . . American Society of Tool Engineers, *International Amphitheater, Chicago. Industrial Exposition and 24th Annual Convention.*

25 . . Malleable Founders' Society,

Drake Hotel, Chicago. Western Section Meeting.

APRIL

12-13 . . Malleable Founders' Society, *Edgewater Beach Hotel, Chicago. Seventh Market Development Conference.*

27 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

MAY

3 . . Non-Ferrous Founders' Society, *Atlantic City, Annual Membership Meeting.*

3-9 . . American Foundrymen's Society, *Convention Hall, Atlantic City, N. J. 60th Annual Castings Congress.*

11 . . Malleable Founders' Society, *Hotel Commodore, New York. Eastern Section Meeting.*

JUNE

4-8 . . American Foundrymen's Society, *Chicago. Committee Week.*

5-8 . . Materials Handling Institute, *Public Auditorium, Cleveland. Materials Handling Exposition.*

6 . . American Foundrymen's Society, *Chicago. Technical Council.*

11-12 . . Malleable Founders' Society, *The Homestead, Hot Springs, Va. General Society Meeting.*

17-22 . . American Society for Testing Materials, *Chalfonte-Haddon Hall, Atlantic City, N. J. 59th Annual Meeting.*

I'm sorry, Gus. I had an irrepressible urge.

FEDERAL GREEN BOND . . . THE PURE BENTONITE

specially selected and prepared for foundry use only

IMPORTANT!

Here's an essential point to remember, when selecting your source for bentonite . . . FEDERAL GREEN BOND is sold and serviced by FEDERAL'S own trained, technical service engineers! FEDERAL'S interest in your use of its products doesn't stop at the time of sale, but continues beyond, in the form of technical service and assistance.

Back in 1925, bentonite was *first* developed, by FEDERAL, as an admix to molding and core sands. FEDERAL GREEN BOND was introduced at that time as *pure* bentonite of the highest quality, specially processed for foundry use. It's been just that ever since—unadulterated, untreated, free of chemicals or other ingredients detrimental to foundry sands or conditions. There are other reasons, too, for its superiority as a sand additive, such as:

FEDERAL *guarantees* that GREEN BOND will produce the *highest* green and dry bond strength of any of the western bentonites.

FEDERAL GREEN BOND'S medium to low gelatinating characteristics cut down on mulling time—permit slurry users to add up to 25% more bentonite per gallon of slurry, without strain on the pumping system.

FEDERAL GREEN BOND has a pH value of 9.0

FEDERAL GREEN BOND lasts and lasts—retaining its bonding efficiency much longer than any other bonding agent.

FEDERAL GREEN BOND induces exceptionally high permeability, permitting the use of fine sands for better casting finish.

FEDERAL GREEN BOND contributes materially to the production of castings that are free of defects—castings that require much less cleaning—castings that look good and bring higher prices.

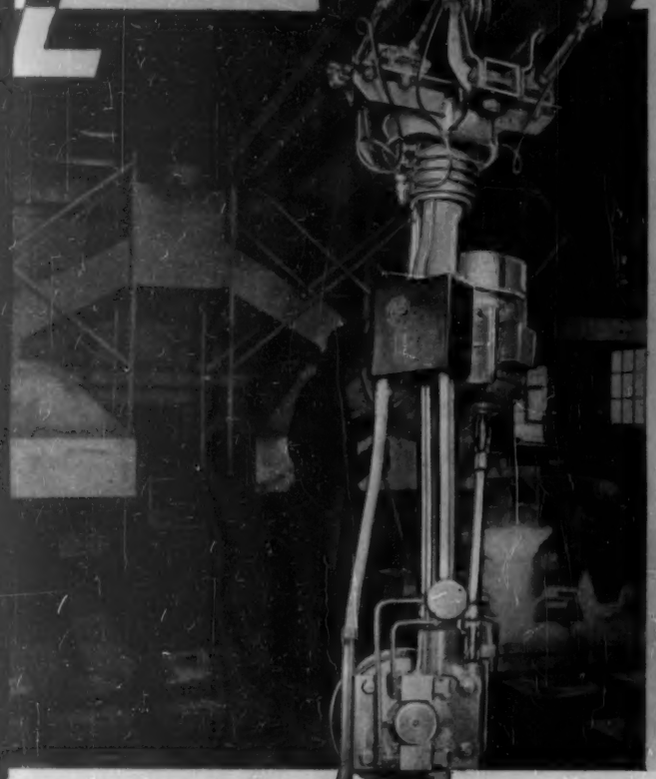
FEDERAL controls every phase of the production of GREEN BOND, from mining and processing to sales and technical service.

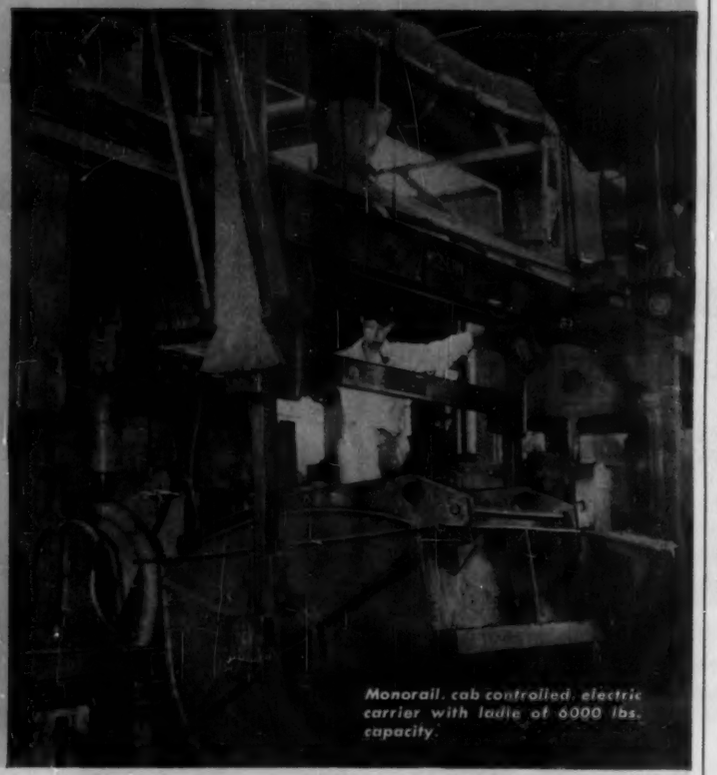
FEDERAL GREEN BOND is carried in stock in FEDERAL warehouses in principal cities in the U. S., Canada, British Isles and Continental Europe. It is available in *three* convenient forms: (1) PULVERIZED—for general foundry use as a dry additive, for core and molding sand. (2) GB-100 FINE GRANULAR—a dry additive with low dust content, for core and molding sand. (3) No. 1200 SLURRY GRADE GRANULAR—for use as a wet additive.

Next time you buy bentonite—try FEDERAL GREEN BOND! You'll soon learn why it's known everywhere as the "BEST OF THE BENTONITES!".

THE FEDERAL FOUNDRY SUPPLY COMPANY

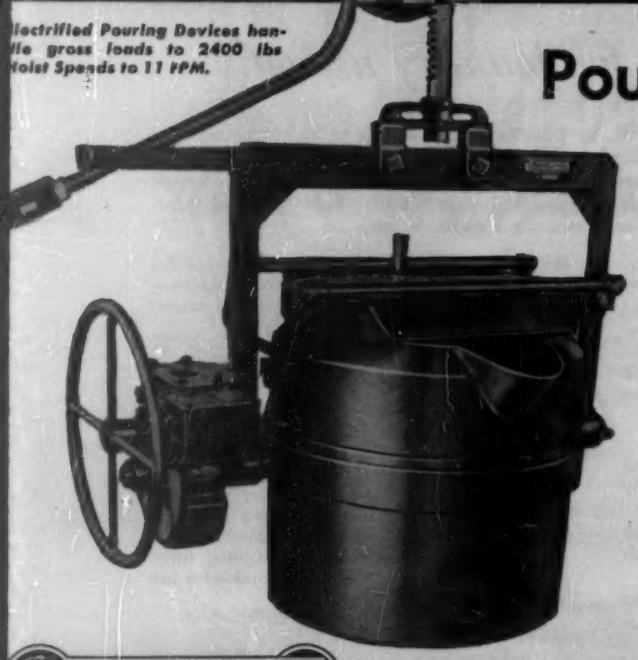
Electrified...





Monorail, cab controlled, electric carrier with ladle of 6000 lbs. capacity.

Electrified Pouring Devices handle gross loads to 2400 lbs Hoist Speeds to 11 FPM.



Pouring and Distribution...

Ever since making the first, mechanical POURING DEVICE numerous patented improvements have been added to cut pouring costs while boosting foundry tonnages. And now with ELECTRIFIED drives for lift, traverse and pouring more castings flow by push button:

- Back-breaking work is eliminated...
- End-of-heat fatigue is minimized...
- Fewer loss-time accidents reduce insurance rates...
- Less metal is pigged...
- Waste due to chilling is nil...
- Over-all quality of metal is high

All MODERN pouring and distribution systems are engineered to the need. Whether the job calls for a basic, standard design or a MODERNIZED, high-speed, cab-controlled, carrying system as illustrated you will want a copy of catalog P-152-A—the latest, MODERN catalog on ENGINEERED POURING SYSTEMS . . .

MODERN

MODERN EQUIPMENT CO., Dept. AF-1, Port Washington, Wis.

Send catalog P-152-A on ladles and pouring ☐
Catalog #150 on cranes, monorail, trolleys, switches ☐
Catalog 147-A on cupolas, chargers, hot blast, dust control ☐

Company .....
Street ..... Zone ..... Box .....
City ..... State .....
My Name .....

New Magazine Down Under

■ A new magazine for the Australian metal castings industry has just been released by a Sydney publisher. The magazine, *Castings*, is published by Fred M. Weierter, industrial advertising representative, technical journalist, and Australian business manager of the New Zealand Association of Scientists.

The first issue the publication was released to coincide with the exhibition of the Australian Foundrymen's Institute. This is the only publication available for the Australian castings industry, since a previous journal, owned by another publisher, suspended publication in October, 1954.

Regular contributors to *Castings* include J. B. Forster, head of the foundry section of the Sydney Technical College and lecturer in metallurgy.

I set the tape recorder on his desk and beat it. I haven't the nerve to ask for a raise.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 69-70. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

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january, 1956
vol. 29 no. 1

modern castings

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TIPS, TRENDS AND TECHNIQUES

Shell mold casting is only one of the metal working operations carried out in the new Westinghouse Blairsville (Pa.) metals plant, just opened for integrated development and production of special castings and special alloys.

Castings Congress Housing Bureau expects as much of a rush for hotel rooms as the AFS Exhibits Dept. has had for exhibit space. To reserve your hotel accommodations for the 1956 AFS Castings Congress & Show, Atlantic City, May 3-9, use the handy form on page 27.

Present ramming technique for green sand specimens doesn't duplicate foundry conditions according to the recent work of three authors. See page 30 for their analysis of the situation and how to remedy it.

When your bronze melting facilities aren't large enough, use your direct arc furnace. To develop a knack for this read pages 34-35.

Your business will be affected if a model workmen's compensation law proposed for state use by the Federal government is adopted by your state. Highlights are given on page 36.

Automatic sand weighing system has speeded sand unloading and eliminated weighing errors. Page 37.

Want a recipe for a built-in safety program that put one foundry's accident frequency 78 per cent below the national foundry average? See page 38.

You never saw so much detail about operations and management policies of five gray iron foundries as they crammed into a recent study. Three of the foundries employing almost identically sized staffs were picked for comparison in this month's Bonus Section—pages 41-56.

Needn't cost much money to carry on a good quality control program. Read pages 57-61 to see how easy it is.

Next month . . . how to avoid paying taxes—honestly . . . shakeout sand sand-blasts itself in pneumatic reclaimer . . . redesigned gray iron castings increase foundry business . . . nondestructive testing Bonus Section . . . metal flow in top, bottom, and step gates.

What's Your Bin S.Q.*?

* Safety Quotient

How safe are your bins? Do you require an employee to endanger his safety and possibly his life by attempting to prod hung-up material from inside the bin. If so, you are creating a definite safety hazard.

Modern plant methods call for—

PneuBin Pulsating Panels

for safe, efficient, mechanical material flow!

PneuBin panels . . . mounted on the inside walls of your present bins and operating from your regular plant air supply . . . inflate and deflate in regulated cycles positively displacing the bin contents to free flow.

PneuBin decreases plant operating costs by reducing maintenance, insures constant material flow to production lines, eliminates accidents to personnel and increases other personnel's efficiency through its quiet operation.

Send for "*Flow Stoppage Report*" and FREE literature. PneuBin engineers will gladly make recommendations with no obligation on your part.

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MAY CORPORATION

MANUFACTURERS OF—

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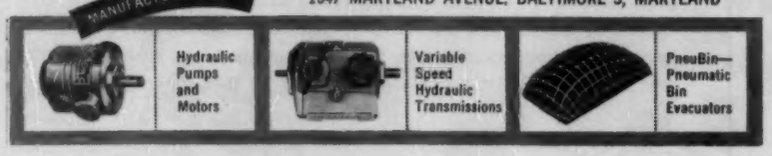


CIRCLE NO. 116, PAGE 69-70

products and processes

Vacuum Cleaning

Kit converts standard 30-gal waste can into auxiliary tank, connected ahead of the vacuum machine to provide additional wet or dry capacity for heavy volume work. Operates with any commercial cleaner. *Premier Co.*

CIRCLE NO. 1, PAGE 69-70

Continuous Dust Filter

Type RJ Reverse Jet deposits dust on the outside of filter sleeves; handles up to 1200 cmf in automatic cleaning and discharge of material operation; may be portable. Bulletin 560. *Day Co.*

CIRCLE NO. 2, PAGE 69-70

Compressed Air Filter

12 oz, fully automatic, self-adjusting EMCO Jet. L200 keeps sludge, scale, and moisture from entering air tools. Handles 1-20 cfm at 60-250 psi. Designed for "point-of-use" application. *EMCO Pneumatic Corp.*

CIRCLE NO. 3, PAGE 69-70

Protection Tube Leak-Checker

Detects molten or gaseous leaks in thermocouple protection tubes immersed in liquid materials; prevents inaccurate temperature readings. *Peerless Electric Co.*

CIRCLE NO. 4, PAGE 69-70

Heavy-Duty Grinding Wheel

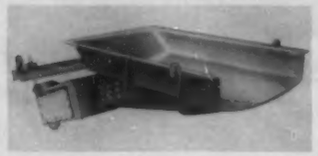
Acts softer but cuts faster than conventional models; particularly applicable to steel foundries with standardized large-scale production; used in swing frame snagging. 16-24 in. diam, 1¼-3 in. thick. *Electro Refractories & Abrasives Corp.*

CIRCLE NO. 5, PAGE 69-70

Trackmobile, rail-road convertible for hauling, switching, and spotting ground. Remodeled emphasis is on power and durability. Although comparatively lightweight, it develops high torque, and acquires traction railroad cars industrial trackage is also useful for hauling carts over the through a jacking coupler that transfers a portion of the freight car's weight onto the trackmobile. Whiting Corp. CIRCLE NO. 29, PAGE 69-70.

Vibratory Feeder

Total enclosure of magnet and leaf springs protects F-55DT against dusty



atmosphere and spillage. 48" x 60" flat pan trough has capacity of 500 tons/hr. *Syntron Co.*

CIRCLE No. 6, PAGE 69-70

Sand Conditioning Unit

Above-floor (no-pit) "80" Preparator conditions up to 78 tons sand/hr, independently or with complete condi-

tioning and mulling units. Cleaner operating conditions, lower maintenance, far lower installation costs. Bulletin. *Beardsley & Piper Div., Pettibone Mulliken Corp.*

CIRCLE No. 7, PAGE 69-70

Titanium-Aluminum "Hardener"

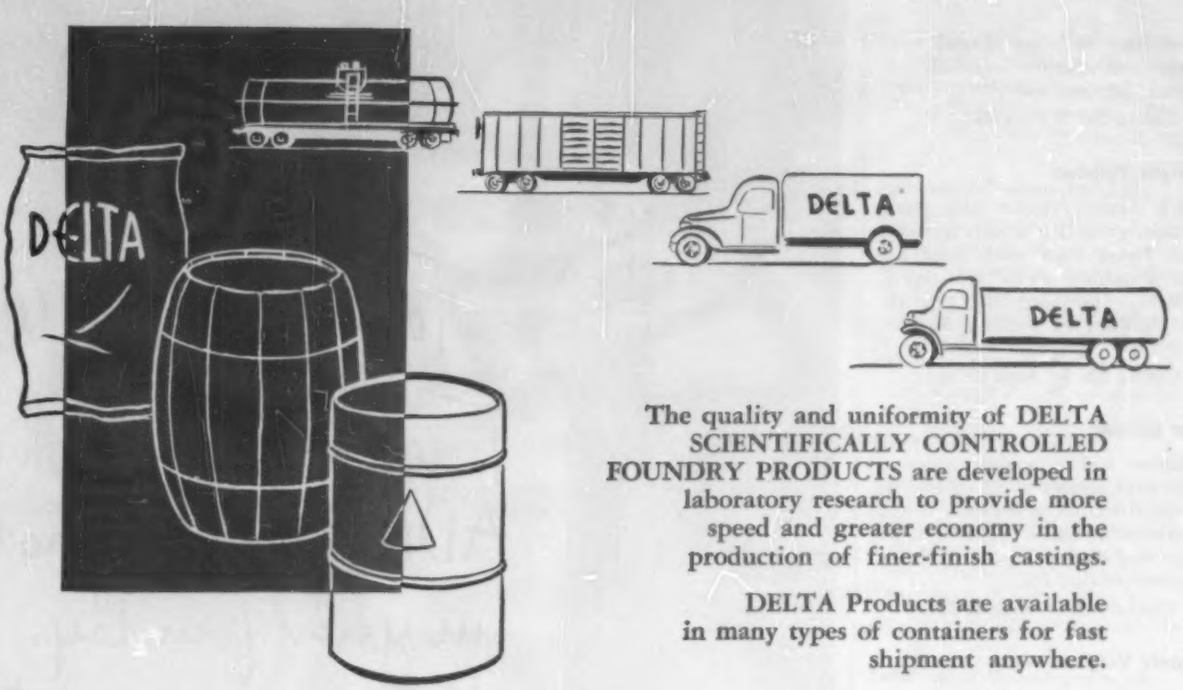
Effect of 5% titanium alloy is to refine grain structure of aluminum sand castings, improve fluidity, castability,

physicals, reduce porosity, prevent hot cracking. Dissolves rapidly without overheating metal. *Shieldalloy Corp.*

CIRCLE No. 8, PAGE 69-70

Winter Roof Leaks

New Monroe emergency repair kit makes possible the repair and resur-



The quality and uniformity of DELTA SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS are developed in laboratory research to provide more speed and greater economy in the production of finer-finish castings.

DELTA Products are available in many types of containers for fast shipment anywhere.

There is a DELTA foundry product to solve your foundry problem

CORE AND MOLD WASHES:

FOR STEEL:
*Special Core and Mold Wash Base
*SteelKoat
*PyroKoat-S
*SuperKoat
*ThermoKoat
*Z-Koat
*ZZ-Koat

FOR ALL TYPES OF SAND CAST METALS:
*ThermoKoat
*SuperKoat
*Z-Koat
*ZZ-Koat

FOR GRAY IRON AND MALLEABLE:
*GraKoat
*BlacKoat
*SuperKoat
*BlacKoat C-2
*BlacKoat C-4
*DriKoat B-3
*DriKoat B-5
*BlacKoat S-5
*PyroKoat-S
*PyroKoat-G

FOR NON-FERROUS METALS:
*NonferrusKoat
*SuperKoat
*GraKoat
*DriKoat-F

PARTING COMPOUNDS:
*Partex
*Super Partex
Liquid Parting
Liquid Parting Concentrate 113XX

MUDDING & PATCHING COMPOUNDS:
*Sliktite
*Ebony

MOLD SEAL COMPOUNDS

*NO-VEIN COMPOUND

SPRAY BINDERS — LIQUID

*DRI-BOND

BONDITE

CORE ROD DIP OIL

CORE OILS

LIQUID RESINS AND BINDERS:
155-X Fast-Dri
168-X Fast-Dri

FOR SAND:
*Permi-Bond (Sea Coal Replacement)
*Sand Conditioning Oils
*96-B Sand Release Agent

FOR SHELL MOLDS:
DELTA-Dietert Process Binder 103XX
(For "D" process shell cores.)

*A Foundry First — by Delta.

DELTA

Get the Facts...

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

CIRCLE No. 117, PAGE 69-70

facing of roofs at below normal temperatures and during snowfalls or rainstorms. *Monroe Co.*

CIRCLE NO. 9, PAGE 69-70

Electrolytic Polisher

1715 AB Electro-Polisher with more power than preceding models includes separate Power Pack with finger-tip control. Polishing cycles are timed. Extension is provided for external beaker polishing or etching. *Buehler Ltd.*

CIRCLE NO. 10, PAGE 69-70

Vernier Caliper

Dull-chrome finished vernier slides of stainless steel Mauser #101 eleminates glare and reflection of ordinary bright steel, results in faster, more accurate readings and mesurements to 0.001-in. *George Scherr Co., Inc.*

CIRCLE NO. 11, PAGE 69-70

Ultrasonic Void Detector

Produces a sonic sound beam through a piece under test in a tank of oil or water; alarm buzzer sounds when void is detected; indicating meter provides visual percentage reading of void signal. Rapid, easy to use. *Sunshine Scientific Instrument.*

CIRCLE NO. 12, PAGE 69-70

Industrial Skin Cream

Hand Save, rubbed into the hands, provides a protective film that keeps substances from coming in contact with the skin; cream and accumulated dirt wash off easily with soap and water. *Stanley Chemical Co.*

CIRCLE NO. 13, PAGE 69-70

Lightweight Safety Glasses

¾-oz Safety Specs are answer to uncomfortable, cumbersome goggles, have sturdy construction and shatterproof qualities. Complete information and trial order available. *General Scientific Equipment Co.*

CIRCLE NO. 14, PAGE 69-70

Hi-Temp, Anti-Seize Compound

Easi-Release B, thread compound, good to 1800 F, leaves no carbon collection to freeze or bind threaded joints, saves maintenance costs through reduced stud breakage, and minimize shut-down. *O. Hommel Co.*

CIRCLE NO. 15, PAGE 69-70

1900 F Ink Marking

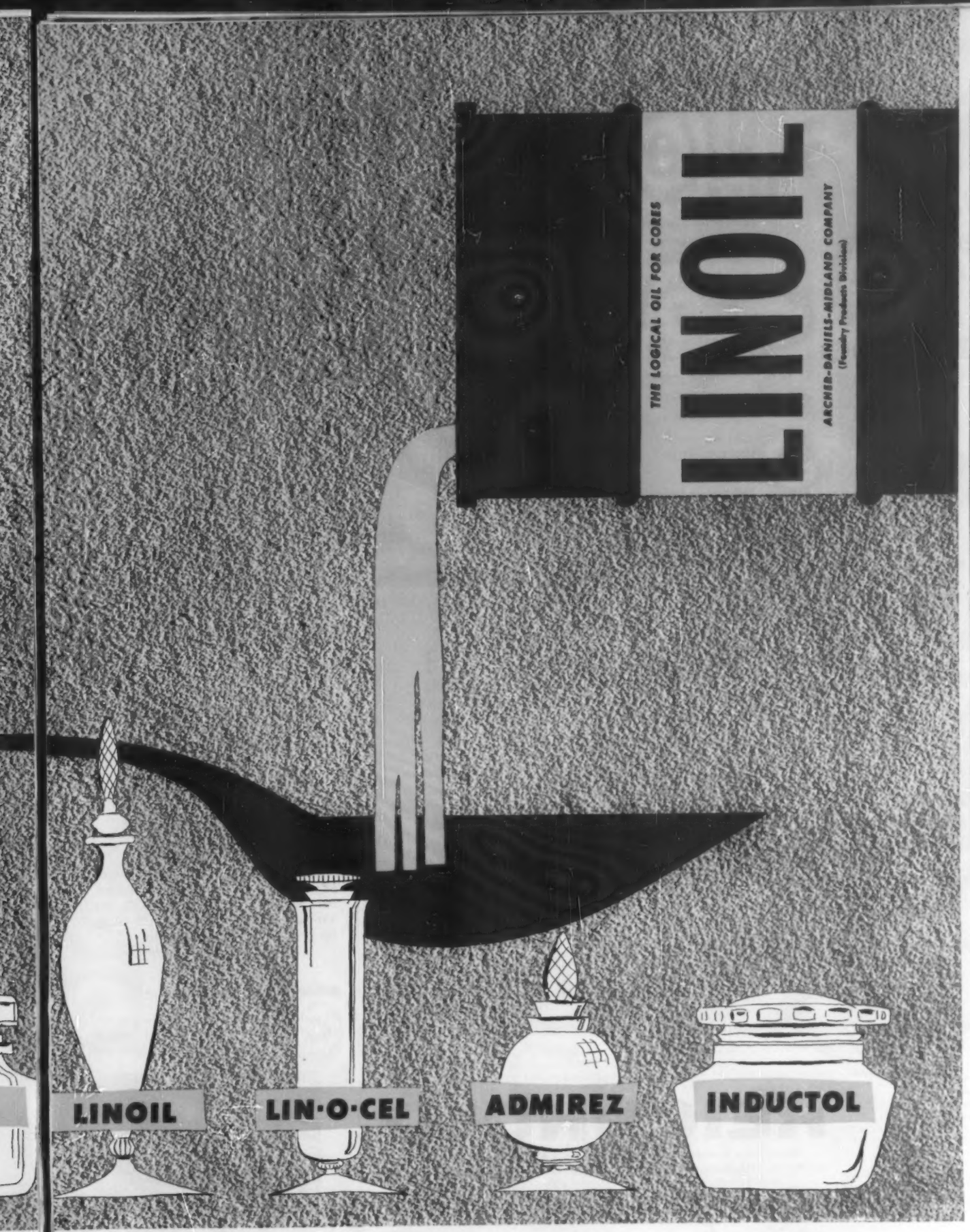
Metal Coding Ink, is fast drying, easily applied by roller, stamp pad, or

℞ Tonic for Casting Ailments...
Troubles vanish when you put ADM foundry products to work in your foundry.
You improve casting quality, reduce core-room costs and foundry rejects.

It pays to see your LINOIL man at least twice a year for diagnosis of core problems.

FOR HEALTHY CASTINGS...PRESCRIBE ADM PRODUCTS...

Archer-Daniels-Midland company



FOUNDRY PRODUCTS DIVISION • 2191 WEST 110th STREET, CLEVELAND 2, OHIO

marking pen; in red, green, blue, yellow, and black for regular annealing temperatures; black only for bright anneal. *Ink Specialties Co., Inc.*

CIRCLE No. 16, PAGE 69-70

Automatic Testing Machine

60,000 lb capacity Super L universal physical testing machine, with an automatic typewriter for printing test results, reduces testing to pushbutton simplicity; can be operated manually if desired. *Tinius Olsen Testing Machine Co.*

CIRCLE No. 17, PAGE 69-70

Heat Treat Basket

2½-ton stacking-type basket withstands temperatures to 2200 F. Rigid construction, portability, adaptability enable them to stay in use for longer time without repair, replacement, or down time. *Wiretex Mfg. Co.*

CIRCLE No. 18, PAGE 69-70

Formulated Grinding Wheels

Electronic computing equipment with punch card system calculates automatically manufacturing formulas for thousands of variations of grinding wheels. "Electronic Formulation" tells the proportion of ingredients needed to meet specification. *Bay State Abrasive Products Co.*

CIRCLE No. 19, PAGE 69-70

Waste Reduction Program

New service to reduce waste and cut cost in plants of 10 to 10,000, includes "tools" for communication, supervision, and evaluation. Brochure. *Clarkson Co.*

CIRCLE No. 20, PAGE 69-70

Reinforced Cut-Off Wheel

Sharper, faster cutting action of "BF" Blue Flash abrasive wheels in foundry applications results from layers of high tensile fabric, new bonds and bonding process, increased abrasive grain content in porous construction. *Bay State Abrasive Products Co.*

CIRCLE No. 21, PAGE 69-70

Self-Dressing Wheels

Porous filler that breaks under impact and opens pore spaces, provides cooler cutting and longer life to new resinoid grinding wheels; will not affect temper

CIRCLE No. 118, PAGE 69-70

Make shell molds faster...
get more accurate castings...
with RCI's

FOUNDREZ 7500

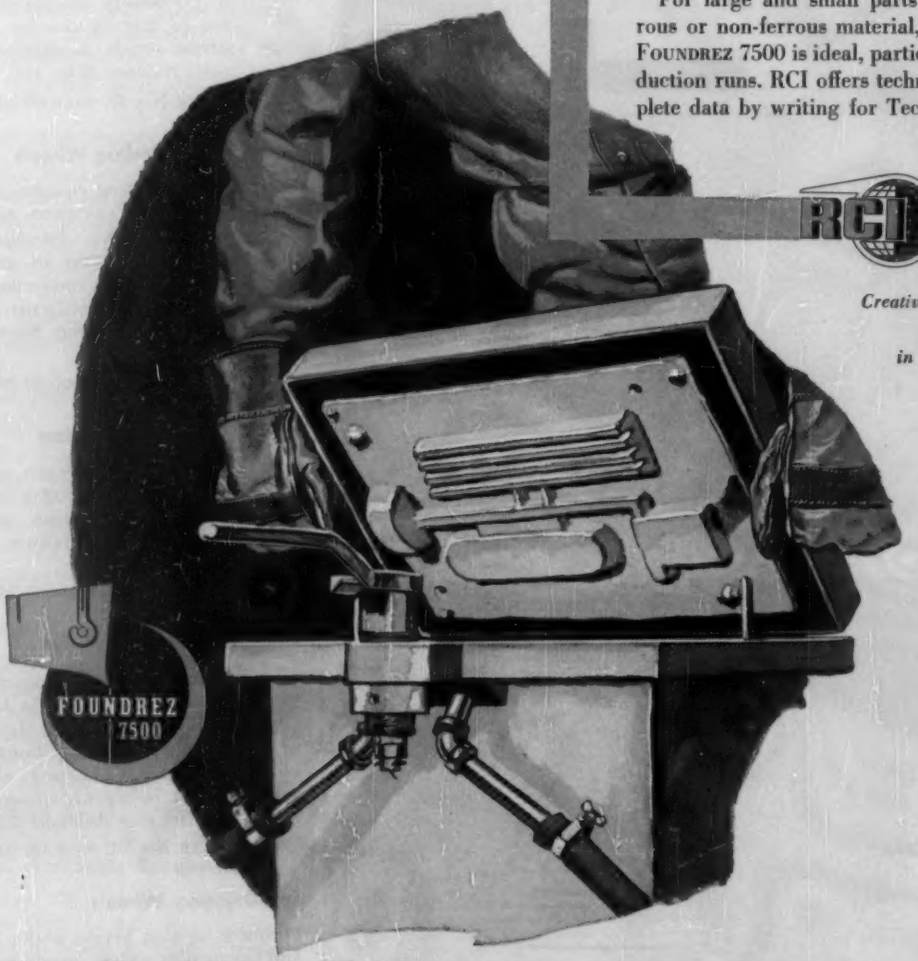
• You save — in *time*, in *labor*, in *materials* — when you make shell-molds with Reichhold's two-stage, thermosetting, powdered phenolic resin — FOUNDREZ 7500. You get castings so accurate that almost no machining is required . . . closely duplicating the actual pattern surface even in the most finely-detailed, thin-walled areas. Rejects are reduced to an absolute minimum.

When you produce shell-molds with FOUNDREZ 7500, curing is *faster*. This remarkable RCI resin takes extremely high oven temperatures, enabling you to turn out more molds per hour . . . molds of uniform superiority. They're structurally stronger, better able to vent gas, freer from distortion.

For large and small parts cast with any ferrous or non-ferrous material, shell-molding with FOUNDREZ 7500 is ideal, particularly for long production runs. RCI offers technical help. Get complete data by writing for Technical Bulletin F-3.

RCI

Creative Chemistry . . .
Your Partner
in Progress



The foundryman unclamps the pattern plate from the dump box. Notice the thin shell of partially-cured FOUNDREZ 7500 and sand clinging to the plate.

REICHHOLD

Synthetic Resins • Chemical Colors • Plasticizers • Phenol
Glycerine • Phthalic Anhydride • Maleic Anhydride • Sodium Sulfate
Sodium Sulfite • Pentaerythritol • Pentachlorophenol

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

CIRCLE NO. 119, PAGE 69-70

of metal being ground at high speed. *Electro Refractories & Abrasives Corp.*

CIRCLE NO. 22, PAGE 69-70

Industrial Vacuum Cleaner

Vac-U-Max, without electrical connections, motor, bearings, or moving parts operates on compressed air; is said

to have suction greater than electric-type equipment several times larger; has 20 gal capacity; uses 25 cu ft/min of free air for wet or dry pickup. *American Balmes Corp.*

CIRCLE NO. 23, PAGE 69-70

In-Plant Fire Truck

Model S-556 carries CO_2, Dry Chemical, Water, and Foam, is 50" wide, 68" high; travels 15 mph, turns in 96"

radius; has 15 cu ft cabinets for accessories, another for extension ladder; 100' hoses for water fog and CO_2 are standard. *Seco Engineering & Mfg. Div., Seco Safety Products Co.*

CIRCLE NO. 24, PAGE 69-70

Adjustable Loading Ramp

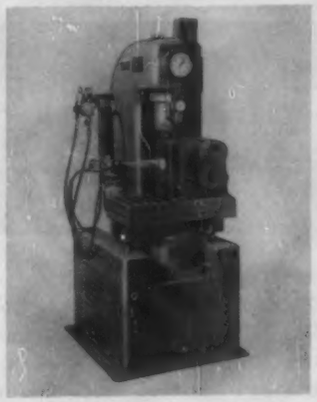
20,000 lb capacity hydraulic ramp, Model 4 M.F., provides push button raising or lowering; compensates for

truck spring deflection during freight transfer. *Rowe Methods, Inc.*

CIRCLE NO. 25, PAGE 69-70

Brinell Hardness Tester

With paint spray attachment synchronized with the testing cycle automatically indicates relative hardness of parts



by spot of paint; sorting of pieces is in effect done by the machine. *Steel City Testing Machines, Inc.*

CIRCLE NO. 26, PAGE 69-70

Shell Sand Preparator

CP Shell Speedmullors (2000-9000 lb/hr) prepare all typical resin-coated sand mixtures by the cold process in 5 min. Complete package includes auxiliaries and controls over all variables, including mulling pressure and air flow through sand. Bulletin, *Beardsley & Piper Div. Pettibone Mulliken Corp.*

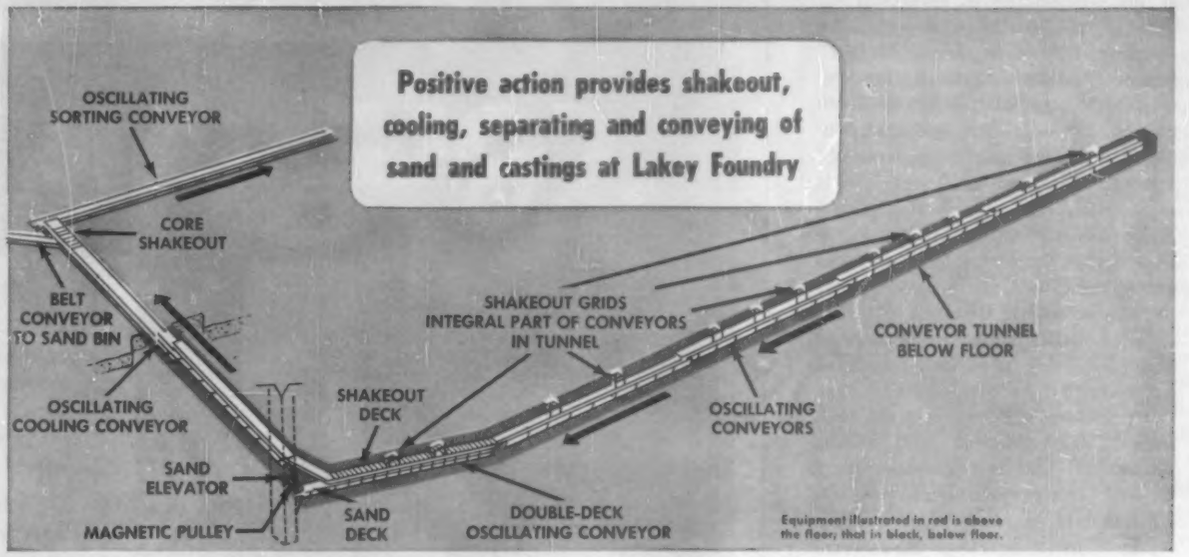
CIRCLE NO. 27, PAGE 69-70

Platform Scale

Model 303, rugged 3000-lb capacity scale with 29" x 94" platform can be installed in just three hours. *Ferguson Products Co.*

CIRCLE NO. 28, PAGE 69-70

Gets MULTIPLE-DUTY with LINK-BELT Oscillating Conveyors


Positive action provides shakeout, cooling, separating and conveying of sand and castings at Lakey Foundry
OSCILLATING SORTING CONVEYOR
CORE SHAKEOUT
BELT CONVEYOR TO SAND BIN
OSCILLATING COOLING CONVEYOR
SAND ELEVATOR
MAGNETIC PULLEY
SHAKEOUT DECK
SAND DECK
SHAKEOUT GRIDS INTEGRAL PART OF CONVEYORS IN TUNNEL
DOUBLE-DECK OSCILLATING CONVEYOR
OSCILLATING CONVEYORS
CONVEYOR TUNNEL BELOW FLOOR
Equipment illustrated in red is above the floor; that in black, below floor.

HERE'S proof that the positive action of Link-Belt Oscillating Conveyors is not affected by surges. The installation at Lakey Foundry, Muskegon, Mich., has 430 ft. of oscillating conveyors performing multiple duties in handling 185 tph of sand and castings.

Five 48-in. wide oscillating conveyors in this system are located under the floor. All have shakeout grids integral with the trough and extending above the floor. Grid units function as tight-flask shakeouts, and sand and castings drop to conveyor trough. The fifth conveyor is double-decked. Sand conveyed on the lower deck passes under a magnetic pulley to remove metal, then is discharged into a bucket elevator. Castings on the upper deck are discharged to inclined oscillating conveyors for cooling and delivery to core shakeout. A flat-top oscillating conveyor above the floor is used for picking and sorting.

Link-Belt equipment and engineering experience — which have produced installations handling up to 450 tph — can bring similar high productivity to your own foundry. For facts on Link-Belt Oscillating Conveyors, call your nearby Link-Belt office or write for Book 2444. These conveyors in standard 36-in. wide sections are available from local stocks.

At shakeout stations, oscillating motion of conveyors breaks sand from flask when flask is set on grids extending up through floor. Sand and castings fall into oscillators.

Link-Belt double-deck oscillator is fed by four other conveyors in tunnel. Top deck carries castings; lower conveys sand under magnetic pulley to bucket elevator.

Worker sorts castings from 54-in. flat-top sorting oscillating conveyor, after the Link-Belt shakeout has knocked out the cores. Capacity is 35 tph.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 12,001

MEMBER FEMA

CIRCLE NO. 120, PAGE 69-70

pouring off the heat

question feeding range data

■ We would like to comment on the paper entitled *"What's the Feeding Range in Shell Molds?"* which appeared in the Bonus Section of the October issue of MODERN CASTINGS. The authors conclude that "feeding range data obtained for conventional sand molds are applicable for shell molds." The justification for this conclusion is that steel plates cast in both green sand and shell molds show the same feeding distance ($4\frac{1}{2}$T). As far as other alloys are concerned this conclusion is reported to have been verified by spot checks.

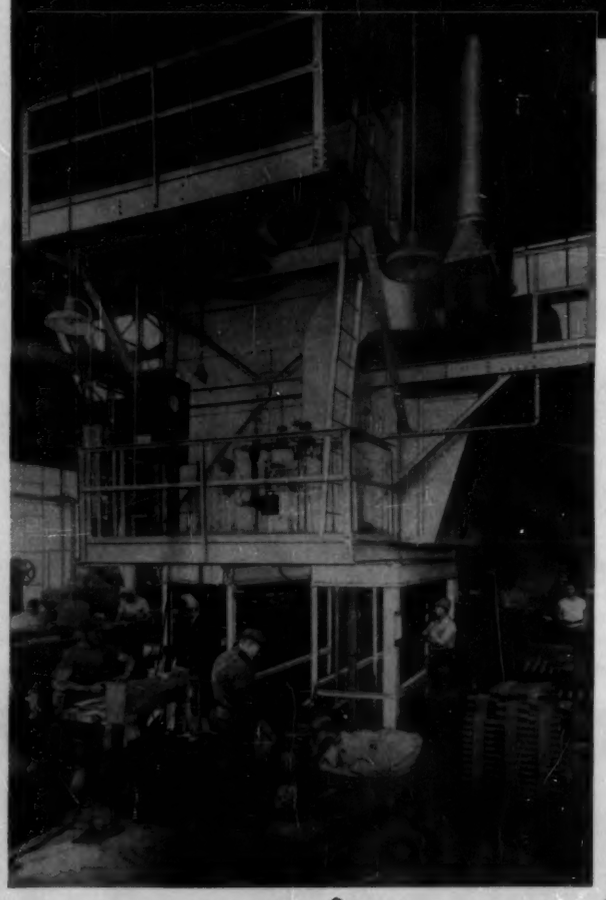
In the work done on steel castings in conventional sand molds, almost all the test castings were poured in a horizontal position (Bishop, H. F., and W. S. Pellini, "The Contribution of Riser and Chill-Edge Effects to Soundness of Cast Steel Plates," TRANSACTIONS, AFS, v 58, 1950, pp. 185-196). In the case of the shell molds, all the castings were poured in a vertical position. The effect of pouring in a vertical rather than a horizontal position was investigated in the case of green sand, but only for 2-in. plates. No significant difference in feeding distance was found, and the authors attribute this to the turbulent flow of metal in the mold. It is difficult to accept the implicit assumption that this finding also holds true for thinner plates.

Published data for nodular iron plates cast horizontally in conventional green sand molds (Shnay, R. C., and S. L. Gertsman, "The Risering of Nodular Iron, Part II —The Effect of Silicon Content on Feeding Distance," TRANSACTIONS, AFS, v 63, 1955, pp. 632-637 and Flinn, R. A., D. J. Reese, and W. A. Spindler, "Risering Ductile Cast Iron," TRANSACTIONS, AFS, v 63, 1955, pp. 720-725) do not agree very well with that reported by the authors for vertically poured castings in shell molds.

The authors do compare their

better production costs less with

COLEMAN OVENS



Coleman Tower® Oven

FAST, EFFICIENT production of uniformly good cores and molds is a major factor in increasing foundry profits. Actual performance records in all classes of foundries show that Coleman Ovens are a profit making investment because they are reducing overall core department costs by as much as 50%.

Outdated ovens may be the most expensive equipment you own. They cannot compete against the modern design and exclusive advantages of Coleman Ovens which are reflected in substantial production economies. Investigate the savings you would realize from Coleman Ovens.

MORE THAN HALF A CENTURY of specialized foundry oven engineering experience is your assurance that the Coleman Oven recommended to you will do your work to your complete satisfaction. Our experienced oven Engineers will give you practical suggestions for your particular requirement.

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World's Only Complete Line of Foundry Ovens

● WRITE FOR BULLETIN 54

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CIRCLE NO. 121, PAGE 69-70

Coleman Transrack Ovens

Coleman Car Type Mold Ovens

Coleman Dielectric Oven

Coleman Rolling Drawer Ovens

Only COLEMAN offers a complete line of foundry ovens with all these advantages

RECIRCULATING HEATING OR DIELECTRIC SYSTEMS to meet your requirement best.

DEPENDABLE BAKING AND DRYING. Coleman Ovens remove all uncertainties in core baking and mold drying. Rejects and make-overs are eliminated.

INCREASED LABOR SAVING. Efficient and modern mechanical designs reduce handling and other indirect labor to a minimum.

HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost under rugged service requirements.

MAXIMUM FUEL ECONOMY. Coleman Heating Systems use the most economical fuel available to you—gas, oil, stoker-coal, electricity, etc.

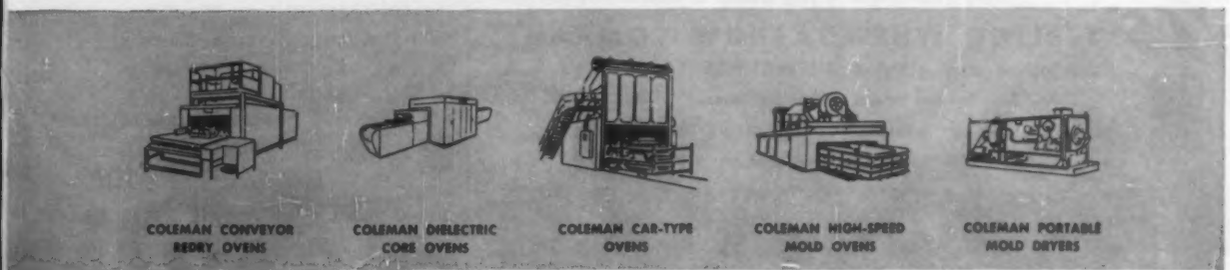
FLEXIBILITY AND ACCURATE CONTROL to bake oil or resin binders—whichever is most satisfactory for your requirements.

BETTER WORKING CONDITIONS. Positive ventilation built into Coleman Ovens prevents leakage of fumes and gases—helps to make the core department a good place to work.

ADVANCED OVEN "KNOW-HOW". Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work.

WIDEST EXPERIENCE. Gained through 50 years of specialization in foundry ovens and the building of more than 11,000 successful Coleman Oven installations.

Let us recommend the RIGHT type of core or mold oven for your requirements — we make them ALL!



COLEMAN CONVEYOR REDRY OVENS | COLEMAN DIELECTRIC CORE OVENS | COLEMAN CAR-TYPE OVENS | COLEMAN HIGH-SPEED MOLD OVENS | COLEMAN PORTABLE MOLD DRYERS

CIRCLE NO. 122, PAGE 69-70

data with some we published (Shnay, R. C., and S. L. Gertsman, "The Risering of Nodular Iron, Part I—Risering Semi-Circular Plate Castings," TRANSACTIONS, AFS, v 62, 1954, pp. 314-316). However, this comparison is not valid since our work was carried out with hypereutectic irons (CE 4.45) and they used hypoeutectic irons (CE 4.20 and 3.60). Some results we published in Part II of our work would offer a more valid comparison since they were obtained with a hypoeutectic iron (CE 4.25). This comparison is shown in the table.

Feeding Distances for Nodular Iron Plates

Plate Thickness	Green Sand*	Shell Molds**
½ in.	3½ in. (7T)	3½ in. (7T)
1 in.	4 in. (4T)	6½ in. (6½T)
1½ in.	4½ in. (3T)	9 in. (6T)

*Shnay and Gertsman
**Morey, Bishop, and Pellini

The agreement is satisfactory only in the case of the ½ in. plates. The low value in the case of the 1½ in. plates cast in green sand is due to an unusual type of shrinkage encountered in our investigation. The 1½ in. plates showed severe swelling in the region where center-line shrinkage would normally be expected. Areas of dispersed shrinkage were found in the regions adjacent to the swell.

We would also like to point out that the generalizations stating feeding distances as simple functions of plate thicknesses is a rough approximation. This is especially true in plates less than 1 in. thick. The errors in using these generalizations are quoted as ±½T, therefore the actual error in inches increases with plate thickness. Whether the errors are appreciable or not will depend on the circumstances in the foundry and cannot be safely predicted in the laboratory.

R. C. SHNAY, *Metallurgist*
Ferrous Section

S. L. GERTSMAN, *Divisional Chief Assistant*
Physical Metallurgy Div.
Dept. of Mines & Technical Surveys
Ottawa, Ont., Canada

■ The data obtained by Shnay and Gertsman for 1½ in. sections should be considered as a special case because of the pronounced

swelling present in their castings. This swelling can be avoided by harder ramming, the use of a stronger sand, or the use of reinforcing bars in the mold. In the NRL work we have, on occasion, encountered such swelling and have discarded the castings containing it because the swells create the condition where the heavy swell section must be fed through the thinner sections adjacent to the riser—a condition which always leads to shrinkage.

Since the swelling was pronounced in Shnay and Gertsman's 1½ in. sections, a lesser degree of swelling could have occurred unnoticed in their 1 in. sections which would have reduced feeding ranges in these cases. If their castings are still available, it would be of interest to check this point.

It may be pertinent to this discussion to realize that "casting soundness" is a relative term and a casting is "sound" or "unsound" according to the standards employed. If one were to be sufficiently critical, using micro-radiography for example, one could probably find shrinkage in any casting.

In the NRL work, casting soundness was determined by means of transverse radiography of a strip removed from the cast section. This technique will show shrinkage in a casting which would appear to be sound by normal x-ray methods.

Shnay and Gertsman were perhaps still more critical in looking for shrinkage. They not only used transverse radiography of a strip, but in some cases subjected the strip to hot acid etching and magnetic particle examination.

Flinn, Reese, and Spindler, who, incidentally, found a 7T feeding range for ½ in. sections and 4½T feeding range for larger sections, sectioned their castings and then sand blasted the cut surfaces to expose shrinkage.

H. F. Bishop, *Head*
Casting Section, Metal
Processing Branch,
Metallurgy Div.
Naval Research Laboratory
Washington, D. C.

CIRCLE No. 124, PAGE 69-70

STERLINGS for BETTER CASTINGS

In the jobbing foundry, shown above, workmen are pouring molten magnesium into molds — an important operation in producing aircraft castings that must meet rigid specifications.

Sterling Heavy Duty Rolled Steel Flasks were selected because they are designed and built for modern casting production. Custom-built . . . all-welded . . . Sterlings have the strength and ruggedness to withstand the heaviest pressures. They retain their rigidity and accuracy over a long period of years.

Sterling sections are reinforced to resist torsion. Even jolt molding can't curl wide sand flanges. If partings need refinishing, there is plenty of metal for several machinings. Special rolled steel flange simplifies ramming . . . prevents soft spots in mold under flange . . . speeds shake-out.

The next time you need foundry flasks, consult the Sterling factory representative in your locality, or write directly to:

STERLING WHEELBARROW COMPANY
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FOR NEARLY HALF A CENTURY manufacturers of FOUNDRY EQUIPMENT

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CIRCLE No. 123, PAGE 69-70

Lower cost per ton of prepared sand with the new

SPEEDMULLOR PREPARATOR UNITS

NO EXPENSIVE PITS FOR INSTALLATION — new floor-level Preparator — only one small pit required for skiphoist bucket.

PACKAGE INSTALLATION—READY TO OPERATE—complete sand conditioning and mulling in one complete package — no extras to buy.

LOW MANPOWER COST — one man can deliver shakeout sand to the unit — operate the unit — and deliver prepared sand to the floors.

LOW MAINTENANCE COST — simple rugged design — proved in hundreds of foundries — years of trouble-free performance.

HIGH CAPACITY—SMALL AREA—No sand system ever before available offers as high a capacity of thoroughly conditioned and mulled sand from as small a floor area — or at as low a cost.

Just check a few of the advantages

It will pay you to investigate now — especially if your sand preparation costs are not as low as you would like. Write today — without obligation — to Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Ave., Chicago 39, Ill.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

IS IT RANGE AND FLEXIBILITY? There's more outright flexibility in these units than will ever be required — handles any size or shape of pattern that will fit on the table and rams one or a thousand molds from each pattern at equally low man-hour costs.

IS IT DEPENDABILITY? Rugged durable B & P construction marks every component of these units. It's in the Sandslinger or Hydra-Slinger, in the turntable, and in the fast accurate B & P Rol-A-Draw. There's a real assurance of lowest maintenance per ton of castings.

IS IT SPEED? No molding equipment can turn out large varied work faster. Here's all of the capacity that can be obtained from four large molding machines. Yet it's all combined in a single compact unit.

IS IT LOW OPERATING COST? Whether it's a four station, or eight station or an even larger unit, all operations can be handled by as few as three men. Here's a unit that will be profitable when operated at full capacity or partial capacity. Here's highest productivity per man-hour.

IS IT LOW INSTALLATION COST? Certainly no multiple molding machine installation can approach the low cost of an equally productive multiple station Slinger Roto-Mold unit.

One slinger does all the ramming, one rollover handles all of the molds. The result is more productive capacity for your equipment dollar.

IS IT SIMPLICITY OF INSTALLATION? Compare the ease and simplicity of delivering all the sand to a single station—of moving all rammed molds from a single station — to the sand delivering and mold handling problems of multiple machines. Then you'll see why these units are so widely accepted, so successfully used.

If you can't afford to get along without any of these important features write now for further information.

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units provide all these features

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talk of the industry

IF EVERY CASTING SHOP in the U.S. reduced its accidents 32% in 1956 the average accident costs (insured and uninsured) per plant would drop approximately $7000! Plants with poor safety records would reduce costs much more. You can do something about it—safety is everybody's business.

DIE CAST ENGINE BLOCK weighing approximately 50 lb (43 lb trimmed), largest die casting to be made in aluminum, is being produced on an experimental basis by Doehler-Jarvis Div. of National Lead Co., in cooperation with Kaiser Aluminum & Chemical Corp. The six cylinder in-line blocks can be produced at a rate of 30 to 35 per hour; development of a V-8 block is underway. Advantages claimed for the blocks include: 129 holes cored and cast to size, weight saving of 132 lb, 10% price advantage over conventional gray iron block, far less machining, less complicated cooling system due to higher heat conductivity and smoother water channels. The die cast blocks are to undergo intensive testing.

YOU CAN STILL MAKE IT. If you haven't returned the National Foundry Association wage survey form sent to you the first of December, fill it in, send it now, so you'll be eligible to secure your copy of the complete castings industry report. This annual survey is invaluable in over-all management planning, particularly as it pertains to your labor agreement negotiations, relative position in the labor market, foundry costs, and union organizational activities.

SMEARING AND ROLLING principle of some of today's sand mixing equipment may hark back to the days when molders mixed sand on the floor by alternately turning it over with a shovel and tramping it down by foot, Earl White, M. A. Bell Co., suggested recently during a visit to the AFS Technical Center. Thought comes from a foundryman who's mixed a great deal of sand both ways since the turn of the century. What's your opinion?

SALES INCREASE of 30% for the investment casting industry has been forecast by Vincent S. Lazzara, Casting Engineers, Inc., president of the Investment Casting Institute. ICI statistics show, he states, that new orders in recent months are pouring in at a rate of 40 to 50% over orders for the same period a year ago. Prediction of $175,000,000 sales in 1956 comes on the heels of an earlier announcement of a 1955 volume of $125,000,000, up 60.7% over 1954.

Herbert P. Scobie

700° wasn't too Hot for this BELT...

IT LASTED TWICE AS LONG...

Dangerous and expensive shutdowns were avoided when a Dandux Double Insulex stitched canvas belt was installed in the refractory above. The heavy asbestos cover, with two insulation layers between it and the body of the belt carried material at 700°, more than twice as long as the rubber belt previously used.

Insulex belting may save you money too.

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INNER-SEWED DANDUX BELTING LOCK-STITCHED

Offices in principal cities:
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CIRCLE NO. 125, PAGE 69-70

let's get personal

Ernest J. Stockum .. named vice-president in charge of research and development for Dayton Malleable Iron Co., Dayton, Ohio. Stockum formerly was general manager of G.H.R. Foundry Div.

Dr. Douglas C. Williams .. transferred from Ohio State University industrial engineering department to metallurgical engineering department. Foundry science courses also transferred to metallurgical department.

Howard K. Beck .. appointed president of Jackson and Church Furnace Div., subsidiary of Norbute Corp.

Gilbert R. Stocum .. named sales engineer for Illinois by Cleveland Vibrator Co. His headquarters will be in Chicago.

Grant S. Diamond .. president of Electro Refractories & Abrasives Corp., has been elected president of Grinding Wheel Institute.

Carl A. Read, Jr. .. named New England territory sales engineer for Taylor-Wharton Div., Harrisburg Steel Corp. His headquarters will be Guilford, Conn.

Samuel T. Johnston .. will sell refractory products in southern states for Kaiser Aluminum & Chemical Sales, Inc., from his headquarters at Birmingham, Ala.

Doehler-Jarvis Div., National Lead Co., announced five promotions. These are: **Fred W. Burgie** to assistant general sales manager, **Charles I. Hodgson** to Toledo sales manager; **John W. Thees** to manager of Toledo plant No. 1; **Kenneth F. Koegler** to manager of Toledo plant No. 2; **Robert H. Mayer** to plant manager of Grand Rapids plants.

Roger J. Keeley .. senior metallurgist, Ajax Metal Div. of H. Kramer & Co. has been honored for his 50 years of service with the firm. Active in the American Foundrymen's Society, Keeley is now vice-chairman of the society's Brass and Bronze Div.

D. L. Mains .. promoted to general manager of Ohio Malleable Div., Dayton Malleable Iron Co., Columbus, Ohio.

Charles H. Luikart .. appointed assistant district sales manager of Cleveland district office of Kaiser Aluminum & Chemical Sales, Inc.

Charles T. Schwarz .. appointed Chicago branch sales manager by Yale & Towne Mfg. Co.

Edwin G. Clarke .. managing director of Acheson Colloids Ltd., London, England, is visiting U. S. plants of the Acheson firm.

Edward O. Dieterle .. rejoins John A. Patton Management Engineers, Inc., as training director.

Carl Snider .. transferred to Detroit to represent chemicals division of Kaiser Aluminum & Chemical Sales, Inc., as salesman in Michigan and northwest Ohio.

Deming H. Lucas .. foundry supply representative has moved office to 6809 N. Grenview Ave., Chicago 26, Ill.

William T. Kelly, Jr. and John S. Hutchins .. elected directors of American Brake Shoe Co. Both are vice-presidents of the company, Kelly heading Kellogg and Sintermet divisions and Hutchins heading National Bearing Div.

Harry Thompson ... appointed sales manager of Ra-Vac, Inc., High Bridge, N. J., manufacturer of fiber glass super heaters.

Frank K. Donnelly .. Seattle enginer has been named sales representative for Torit Mfg. Co.

Edward H. Burgess, Jr. . . opens sales office in Providence, R. I., for Samuel Greenfield Co., Inc., smelters and refiners of brass, bronze and aluminum ingot.

Frank A. Gross .. appointed an assistant to G. E. Burks, vice president in charge of engineering and research for Caterpillar Tractor Co., Peoria, Ill.

Richard W. Smith .. named director of advertising of American Air Filter Co., Louisville, Ky.

William H. Depperman .. appointed director of public relations of Link-Belt Co., Chicago.

Richard J. Hollmeyer .. named a Cincinnati district sales engineer for Dravo Corp., Pittsburgh.

Grover C. Arnwine and James V. Fairley .. both appointed as assistant sales managers for Alabama By-Products Corp., Birmingham, Ala., foundry coke producer.

Three men at dinner for R. J. Keeley whose company service totals 161 years. E. D. Brack, left, Keeley, and Dr. G. H. Clamer, consultant and former president of company and AFS.

F. P. Benson, Jr. .. joins McKinsey & Co., New York, as consultant in manufacturing. Mr. Benson was once active in non-ferrous shell molding.

Harry E. Blumenthal .. named executive vice president of American Iron and Supply. Blumenthal leaves post as representative for R. Lavin and Sons, Inc., to take charge of all sales and purchasing for the Minneapolis scrap metal processing firm.

Henry Davis .. named Twin Cities director of sales and purchasing for American Iron and Supply Co., Minneapolis.

Robert W. Bruins .. named manager of handler sales for Colson Corp., Elyria, Ohio.

G. L. Weissenburger .. president of Keokuk Electro-Metals Co., Keokuk, Iowa, awarded honorary degree of Doctor of Laws by Parsons College, Fairfield, Iowa.

G. C. Arnwine

J. V. Fairley

G. Weissenburger

David C. Ekey . . appointed as Lebanon Steel Foundry's director of research. Dr. Ekey leaves Penn-

D. C. Ekey

sylvania State University to head expanded research program of Lebanon, Pa., foundry.

George R. Milne .. succeeds late J. Carl Bode as president of Na-

G. R. Milne

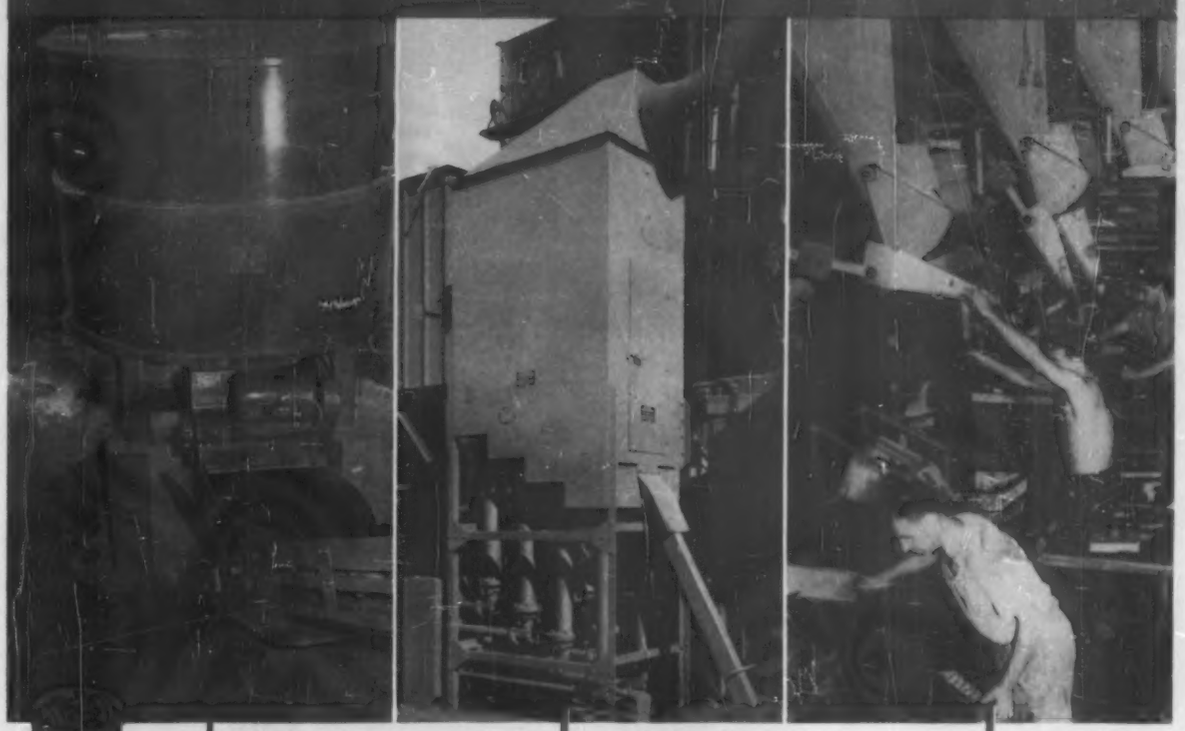
tional Carbide Co., a division of Air Reduction Co., Inc.

L. Lippa

Louis Lippa . . elected to presidency of Apex Smelting Co., Chicago, on the resignation of **Robert K. Beck** as president and director.

NATIONAL

Sand Equipment and Service for BETTER Sand Practice



mixing | reclaiming | handling

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• Today's Simpson Mix-Muller has been improved to provide infinite control over muller pressures. Maximum pressures are automatically developed as the sand increases in strength towards the end of the cycle.

• The National Pneumatic Sand Recovery System has made the dry recovery of "burnt out" sand practical — and within the economic and physical reach of most foundries.

• The services of your National Engineer have been broadened through the years to offer practical, experienced assistance in every phase of sand handling, molding and casting practice.

• A subsidiary company, National Dust Collector Corporation, now offers a wet type dust collector that can cite efficiencies of 98.2 to 99.1% in collecting foundry shakeout dust.

These are but a few of the reasons why when you *buy National* you buy products of the practical foundrymen . . . made for the foundry, *by* foundrymen.

If your problem is in sand preparing, sand handling, mold handling or excessive waste sand — call your National engineer today.

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CIRCLE NO. 126, PAGE 69-70

Now you can

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in 12 seconds

by the magic of the

CO_2 PROCESS

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***STEINEX** is a remarkable core sand binder. Cores and shell molds, made of sand mixed with STEINEX, can be hardened right in the corebox in a few seconds by the injection of carbon dioxide.

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CIRCLE NO. 127, PAGE 69-70

Howard P. Chace and F. Kenwood Jones .. Chace has retired as chief

H. P. Chace

sales engineer for Norton Co. Grinding Machine Div., Worces-

F. K. Jones

ter Mass. He is succeeded by **F. Kenwood Jones.**

William L. Hinds, former board chairman of Crouse-Hinds Co., Syracuse, N. Y., watches granddaughter Barbara Truman cut ribbon to open the William Lawyer Hinds Hall of Engineering, Syracuse University. Mr. Hinds is garbed in academic robes of Honorary Doctor of Laws, a degree granted him by the Syracuse school in 1951.

AFS Starts CO_2 Investigation

■ Foundries using the CO_2 Process will be visited by members of the American Foundrymen's Society Core Test Committee which is making an evaluation of the process.

At a recent joint meeting of the Core Test, Bakeability Test, Blowability Test, and Core Stickiness Committees a questionnaire was formulated to use in collecting data for the evaluation. Foundries completing the questionnaire will be asked to describe their sand mixture; carbon dioxide source, valving and injection equipment; cores and molds; and sand storage and reclamation methods.

At the meeting of the committees a comprehensive report of the baked tensile test of cores was studied, and it was recommended that the tensile briquet should be made a standard test. In addition, it was recommended that the tolerance of error on the laboratory test should be lowered from 15 per cent and that a reference core oil should always be used. These recommendations have been forwarded to the Executive Committee of the AFS Sand Division for action.

IE-Cost Group Elects Boswell

W. E. Boswell, Glamorgan Pipe & Foundry Co., Lynchburg, Va., has been elected chairman of the Industrial Engineering and Cost Committee of the American Foundrymen's Society. He succeeds J. J. Farkas, Cincinnati Milling Machine Co., Cincinnati, C. R. Culling, Carondelet Foundry Co., St. Louis, has been elected vice-chairman.

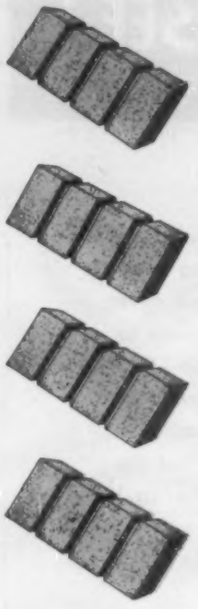
Culling's duties are to include recruiting new committee personnel from the membership of the Steel, Malleable, and Non-Ferrous Societies.

The committee also discussed tentative selection of papers for presentation at the 1956 AFS Castings Congress. Subjects selected include costs, quality control, incentive plans and human relations.

CIRCLE NO. 128, PAGE 69-70

WHY?

Use Famous CORNELL CUPOLA FLUX



WHY Because no iron is top quality unless it's clean! Famous CORNELL Cupola Flux is the one scientifically formulated product that increases slag flow off.

WHY Because our Flux guarantees complete cleansing of coke—giving carbon constant!

WHY Cupola maintenance is reduced. Digging out time is less as drops are cleaner and bridging over practically eliminated.

WHY Because Famous CORNELL Flux is made in easy-to-handle brick form. Each charge of iron takes one brick—For charges less or more than a ton, break off a proportionate number of scored sections.

The Benefits . . .
The Advantages of
***Famous* CORNELL**
Aluminum and Brass Flux

Makes metal pure and clean.

Permits use of more scrap without danger of dirt, porous places, or spongy spots due to dirty metal.

Thinner, yet stronger sections can be poured.

Metal does not cling to the dross as readily.

Crucible or furnace linings are kept clean.

Cleanses molten brass even when the dirtiest brass turnings or sweepings are used.

Saves considerable tin and other metals.

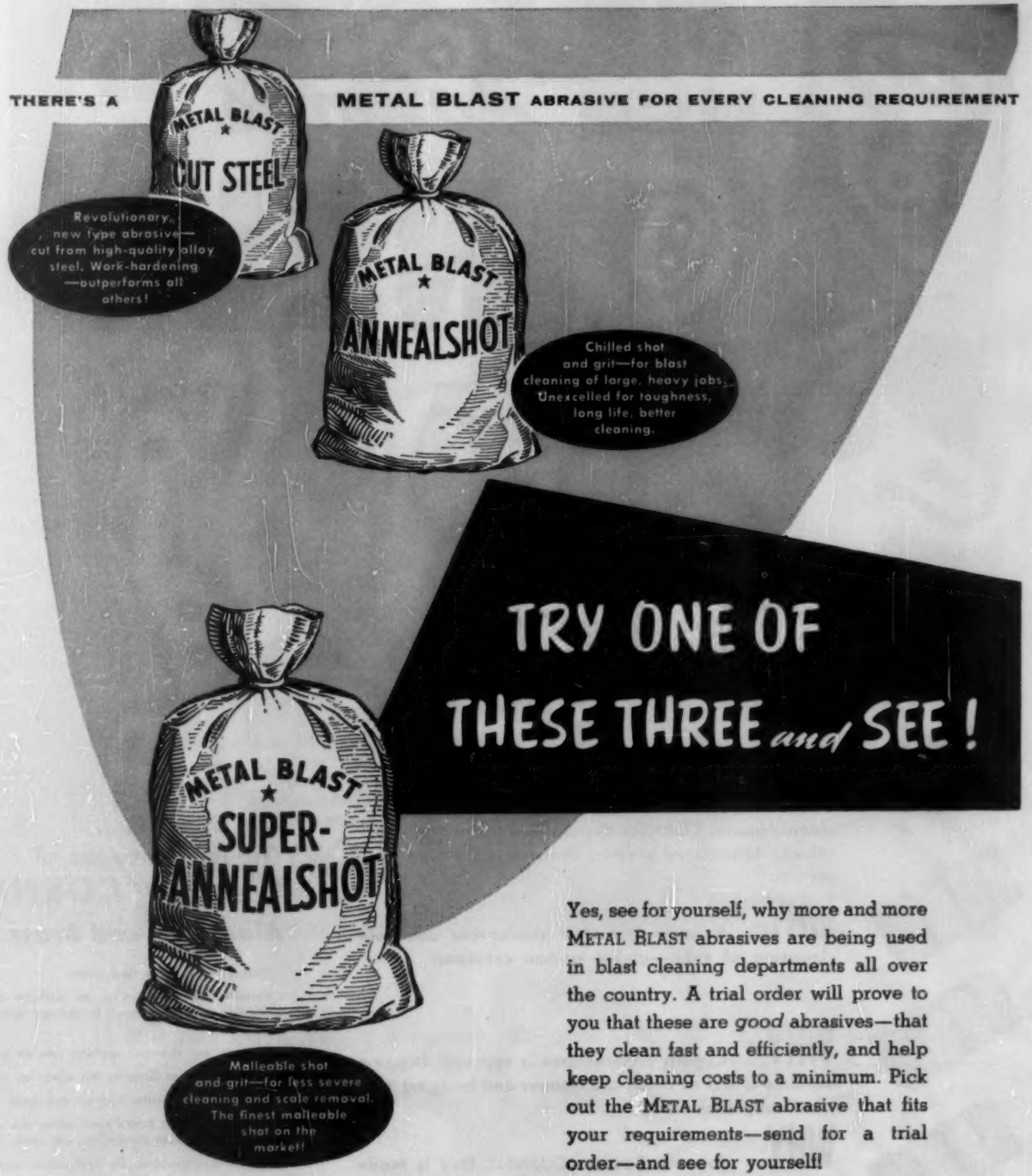
Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write For Bulletin 44-A

The **CLEVELAND FLUX** *Company*
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

THERE'S A METAL BLAST ABRASIVE FOR EVERY CLEANING REQUIREMENT


METAL BLAST
CUT STEEL
Revolutionary new type abrasive—cut from high-quality alloy steel. Work-hardening—outperforms all others!
METAL BLAST
ANNEALSHOT
Chilled shot and grit—for blast cleaning of large, heavy jobs. Unexcelled for toughness, long life, better cleaning.
METAL BLAST
SUPER-ANNEALSHOT
Malleable shot and grit—for less severe cleaning and scale removal. The finest malleable shot on the market!

TRY ONE OF THESE THREE *and* SEE!

Yes, see for yourself, why more and more METAL BLAST abrasives are being used in blast cleaning departments all over the country. A trial order will prove to you that these are *good* abrasives—that they clean fast and efficiently, and help keep cleaning costs to a minimum. Pick out the METAL BLAST abrasive that fits your requirements—send for a trial order—and see for yourself!

METAL BLAST, INC.

872 EAST 67th STREET • CLEVELAND 3, OHIO

First Study of Western Sands

West Coast foundry sands are now being studied by a committee of the American Foundrymen's Society headed by H. E. Henderson, H. C. Macaulay Foundry Co., Berkeley, Calif. This is the first comprehensive study ever to determine the properties of western sands for comparison with midwestern sand.

The West Coast Committee of the AFS Sand Division, announced after a meeting in Berkeley on October 11, that it will find out how many sands are available on the West Coast and determine their base permeability, sand grain distribution, grain shape, sintering point, and other fundamental characteristics.

Two most commonly used West Coast sands will be selected and compared with the properties and characteristics of the two most commonly used imported midwestern sands. A test pattern will be used and castings will be made in comparable western and midwestern sands using the same ingredients in blended mixtures. Quality of castings produced will then be observed.

As a result of this study, which is expected to last over a year, the committee expects to make definite recommendations to West Coast foundrymen on the properties of local sand.

Just the sand, Horace, just the sand!

CIRCLE NO. 129, PAGE 69-70

GIFS Speaker Hits Scrap Cost

"Procurement of scrap metal at a reasonable price is a universal problem in the gray iron castings industry today," E. H. Mitchell, field director of the Gray Iron Founders' Society, stated in addressing the GIFS Chicago Area Management Group at the Graemere Hotel in Chicago, November 29.

High prices being asked for scrap are the result of heavy exports of scrap according to the speaker.

Mitchell stated that GIFS will embark on a more vigorous promotional and educational program to show castings buyers the virtues and the range of properties of gray iron. New markets and product development are to be stressed by the society, he said.

In selling a casting, the producer is selling the service which that casting will perform. A casting is a precisely manufactured commodity and should be sold by the piece and not by the pound, Mitchell pointed out.

Elections of officers for the management group were held after H. W. Johnson, Wells Mfg. Co., Skokie, Ill., presented the nominations in the absence of George Edwards, Woodruff & Edwards, Inc., Elgin, Ill., chairman of the nominating committee. Following new officers were elected: C. R. Lindgren, Lindgren Foundry Co., Batavia, Ill., *president;* W. G. Greenlee, Greenlee Foundries, Inc., Chicago, *vice-president;* C. V. Adams, Vulcan Iron Works, Chicago, *secretary.*

Trade Group Elects Officers

John R. Shumway, C. W. Shumway & Sons, Batavia, Ill., was elected president of the Chicago Foundrymen's Association at the group's annual meeting November 17.

J. K. Hodgson, Hodgson Foundry Co., Chicago, was elected vice-president; R. H. Lempuhl, Sheffield Foundry Co., Chicago, was re-elected secretary-treasurer; H. R. Erickson, Noonan-Malmstrom Co., Chicago, was named a director.

Mildred Kosar was retained as executive secretary.

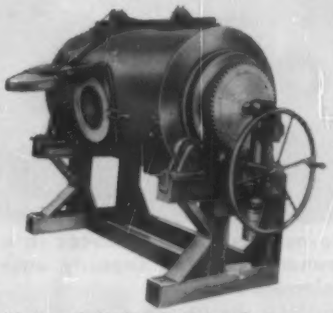
Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.

Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

For Non-Ferrous Metals
A complete line of

LINDBERG FISHER

MELTING AND HOLDING FURNACES



Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

Because Lindberg-Fisher builds *all* kinds of melting equipment ... gas ... oil ... electric ... induction, and Carbon arc ... L-F engineers are able to recommend, without prejudice, the proper type of furnace for your particular melting requirements.

Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.

Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

Melting specialists for 25 years
Sales and service offices in principal cities

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company, 2440 West Hubbard Street • Chicago 12 • Illinois

CIRCLE NO. 130, PAGE 69-70

For die casting and permanent MOLDING of Aluminum or Copper Alloys

USE CRUCIBLES *for* MELTING *and* HOLDING

Here's why...

For "cold chamber" die casting and permanent molding, melting and holding the metal in crucibles is preferred because of lower cost, better regulation and "crucible" quality metal.

Crucibles are easier to clean and keep clean. There is less build up of aluminum oxide and dross and no penetration of the crucible wall. Iron contamination is completely eliminated.

Automatic temperature control is readily maintained.

Gas or oil fuel used with crucibles provide the lowest available heat cost.

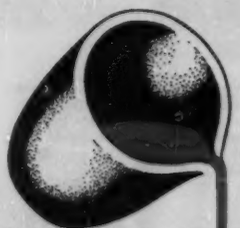
Crucible furnaces may be shut down over night or during non-working periods without any fuel consumption or supervision.

Battery of "ladle-out" crucible furnaces in a permanent mold foundry. Working capacity each furnace, 300 lbs. of aluminum.
Photo courtesy The Campbell-Housfeld Co., Harrison, Ohio

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING.

LAVA CRUCIBLE-REFRACTORIES CO.
AMERICAN REFRACTORIES & CRUCIBLE CORPORATION
JOSEPH DIXON CRUCIBLE CO.
VESUVIUS CRUCIBLE CO.
ELECTRO REFRACTORIES & ABRASIVES CO.
ROSS-TACONY CRUCIBLE CO.

Have you seen the new " 'CRUCIBLE CHARLIE' says . . ." leaflets issued by Crucible Manufacturers Association? If not, ask your superintendent about this. He has a copy.



Crucible Manufacturers' Association

40 EXCHANGE PLACE, NEW YORK 5, N. Y.

CIRCLE NO. 131, PAGE 69-70

Set Rules For pH Sand Control

■ Seven general rules for pH measurement of molding sand mixtures have been recommended by the American Foundrymen's Society. These rules are:

- Colorimetric testing and pH papers are not suitable for pH measurement. However, these may be of value in comparative testing for control within a plant.
- ASTM Specification E70-52T is to be used for checking pH values.
- Distilled water in a pH range of 6.0 to 7.0 should be used in testing. If the pH of the water should drop below 6.0, boil and then cool. If the pH is not raised above 6.5 by boiling, discard the water. In a contaminated surrounding atmosphere the distilled water should be kept in tightly closed containers. Do not use tap water regardless of pH value.
- Wash electrodes with distilled water and wipe with tissue.
- Use a buffer solution within 1.0 unit of the material measured.
- Note error due to conductivity by sodium when standard glass electrodes are used at pH values above 9.0. Should the standard glass electrode be used the readings will be too low. Reasonably close measurements may be made by standardizing with a pH 10.0 buffer solution but care must be taken to completely wash the buffer solution from the electrodes.
- A uniform solution or suspension is essential in obtaining correct results in pH measurement. The pH meter measures the pH value at the tip of the glass electrode only. If there is variation in concentration in the solution or suspension being tested, the meter reading will vary as the glass electrode is moved. This variation is particularly noticeable where materials settle out. To minimize this condition stir during testing. Magnetic stirring devices should be checked for effect on pH readings before using.

MORE FACTS on all products, literature, and services shown in the advertisements and listed in Products & Processes and in For the Asking can be obtained by using the handy Reader Service cards, pages 69-70.

How to Dismiss an Employee

■ One of the most important yet most mishandled responsibilities of management and supervision is the dismissal of unsatisfactory employees according to the Industrial Relations Committee of the Non-Ferrous Founders' Society in the NFFS *Crucible*.

It is the normal practice of most small business to dismiss employees without any consideration of the results of this action on employee relations or public relations in his community. This often results in the ex-employee informing his fellow employees and his friends in the community of the harsh and unfair treatment he has received.

Dismissal of an employee, at best, is an extremely difficult experience for both the employee and the supervisor. But there are steps which can be taken to lessen the impact of this action:

■ 1. Compile a written record of the employee's lack of qualification or ability to perform the assigned job. Note particular incidents which have pertinent bearing on this record.

■ 2. Review the employee's qualifications to find the type of work in which they can be utilized best.

■ 3. Call the empoyee to some convenient location away from his fellow workers and give him the reasons for his dismissal. Point out that he could do a satisfactory job in whatever type of work his qualifications fit. If possible, it is well to extend a helping hand in the way of recommendations, etc., to enable the man to find other employment.

An employee so released can still save face and embarrassment by correctly describing the interview to his fellow employees and friends in the community. In this way, the discharged employee, as well as the employer, has benefited.

Heavy Reading on Light Metal

Bound copies of all papers at the 11th annual convention of the Magnesium Association in New York, October 31-November 1, have been published.

Copies are available from the office of the association, 122 East 42nd St., New York 17, at $5.00 per copy. The 140-page volume incorporates 12 papers.

Now, more than ever, you can depend on

HANNA

as your best source for

PIG IRON

- *Our merchant capacity is bigger than ever*
- *Our plant is better than ever*
- *Our product range is greater than ever*

The
HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New
EXCLUSIVE HANNATEN INGOT

For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

CIRCLE NO. 132, PAGE 69-70

Yes Sir, that's my baby!

WHEELABRATOR'S Newest abrasive development

STEELETTS®

for maximum economy in grit blasting

Just born . . . Steeletts . . . a high hardness grit with the life of steel. Free from the brittle carbides that cause rapid breakdown of chilled iron abrasives, each particle of Steeletts has a longer, more productive working life span than any other grit. This means maximum economy.

Steeletts do not chip away on each impact but retain their size and shape longer than any other grit, thereby increasing the impact power of each pellet while lengthening the life of the abrasive. This adds up to maximum economy.

Steeletts are in the same hardness range as chilled iron. This hardness pinpoints the impact of the blast, resulting in speedy removal of even the hardest alloy steel scale and fast and deep etching of the hardest surface. This, too, contributes to maximum economy.

Steeletts retain their basic grit shape when used but the sharp edges become dulled. The grit shape imparts the matte finish essential for grit-blasted surfaces but the dull edges minimize the problem of embedment and reduce the wear and maintenance problems caused by the sharp fracturing edges of other grits. This, too, adds up to maximum economy.

For more information on Steeletts, send today for your copy of Bulletin 901-D. It's filled with valuable information on this new, long-life, high-speed, low-cost abrasive development.

WHEELABRATOR CORPORATION
(Formerly American Wheelabrator & Equipment Corp.)

World's Largest Manufacturer of Airless Blast Equipment and Steel Abrasives

630 S. Byrkit St., Mishawaka, Indiana

A. C. Hensel and advertising tie

It Pays to Adver-Ties

■ Albion Malleable Iron Co., Albion, Mich., finds that it pays to advertise its company emblem on neckties, tie clasps, cuff links, and ear rings. All jewelry items are castings. Alden C. Hensel is wearing the tie and the tie clasp in the picture above, while his wife is at home with her cast brass, quadruple gold plated ear rings.

Collins Carter, president of the company, presented these items to executives of the company and they are being worn to conventions and conferences around the country. The tie picture with Hensel, Albion personnel relations director, has accompanied him to Foundry Educational Foundation meetings in Cleveland and to American Foundrymen's Society conventions.

At the time the picture was taken, he was speaking at the Ohio Regional Foundry Conference. If no soup or gravy spots interfere, this interesting neck wear will be seen at the AFS Castings Congress next May.

Westinghouse is another organization that has put itself into the jewelry field. Technical publication editors touring the new Westinghouse Metals Plant were supplied with cuff links made of Refractaloy, a Westinghouse developed nickel-cobalt-chromium-molybdenum-iron alloy. The principal use of this alloy is in gas turbine blading.

CIRCLE NO. 133, PAGE 69-70

Dixie Regional on Calendar

■American Foundrymen's Society members from the southeastern states will gather together for the twenty-fourth time February 16-17 at the Southeastern Regional Conference, Tutwiler Hotel, Birmingham, Ala.

This two-day regional event is sponsored by three AFS chapters: Birmingham District Chapter, Tennessee Chapter, and the University of Alabama Student Chapter.

John F. Drenning, Kerchner Marshall Co., general chairman and program chairman of the conference has announced a program that includes papers on *"Shell Cores," "Job Evaluation," "Selecting Sands," "High Pressure Molding," "Co_2 Process," "Cleaning Castings,"* and *"Upgrading of Iron."*

The morning of the second day of the conference will be devoted to plant visitations and the conference will close with the annual banquet.

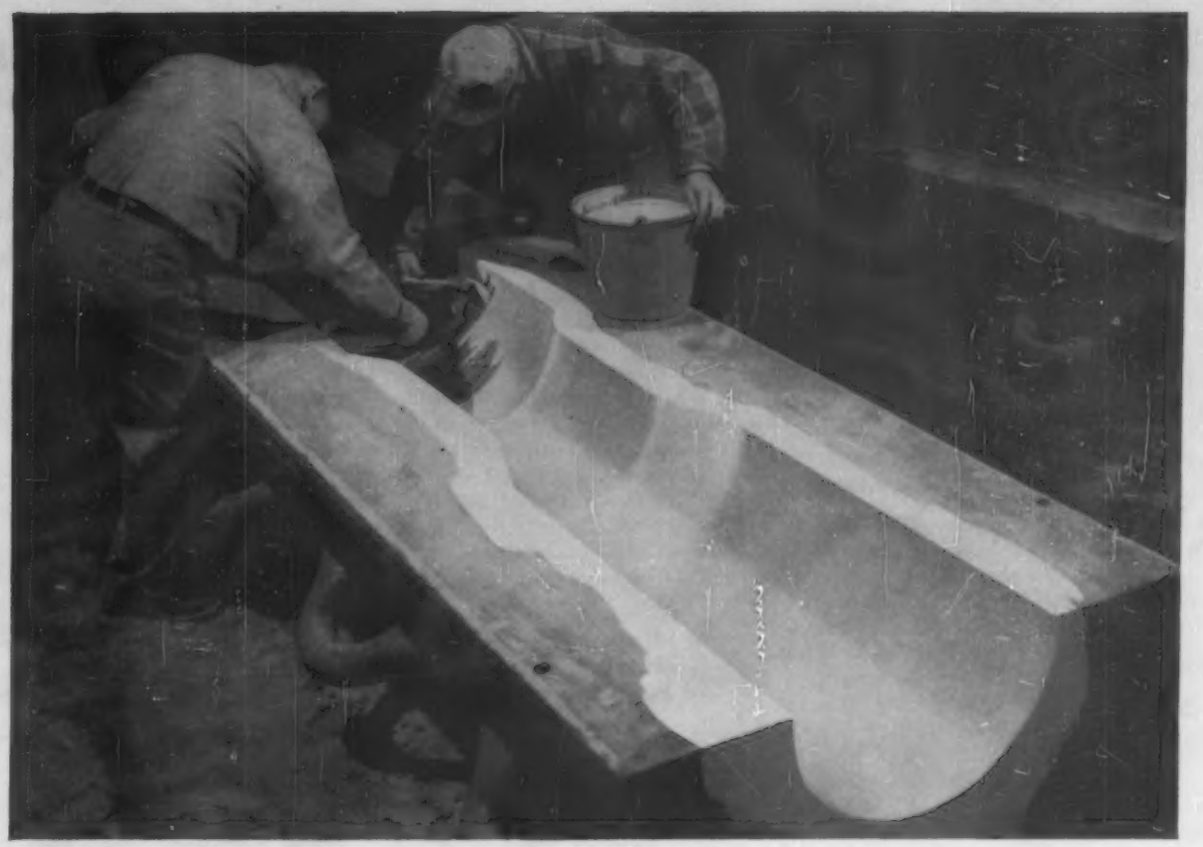
I don't CARE how your wife does it . . You do it OUR way.

Start Air Pollution Publication

A new publication announced by the Air Pollution Control Association, Pittsburgh, will summarize all current literature on air pollution and its control.

The first issue of the publication, *APCA Abstracts*, summarizes 51 publications covering subjects including control of air pollution, sampling, measurement, analysis, and detection of pollutants.

These abstracts are available from the Air Pollution Control Assn., 4400 Fifth Ave., Pittsburgh.



Put a superfine finish on YOUR castings

with Supersil Silica Flour

In your mold wash, Supersil always gives the same even coating and thickness of application. Its high fusion point and excellent refractoriness help you to reduce metal penetration, minimize surface defects and produce castings with super-smooth finish.

Added to your molding sand, Supersil increases dry and hot strengths as well as sand toughness. Your sand mixture is more workable and will hold dimension better. Moreover, the ability of the mold to maintain its shape at pouring temperatures is increased with Supersil. The exceptionally high fusion point of Supersil increases the overall sintering point and fusion point of the sand mixture.

Unequalled quality (99.9% SiO_2) and perfect uniformity, shipment after shipment, make Supersil the best Silica Flour for you. To obtain further information and free working samples, contact **Pennsylvania Pulverizing Company, Two Gateway Center, Pittsburgh, Pa.**

P.G. Co.

Pennsylvania Glass Sand

P.P. Co.

Pennsylvania Pulverizing

The Nation's Leading Producers of Pure Crystalline Silica

BERKELEY SPRINGS, W. VA. · MAPLETON, PA. · McVEYTOWN, PA. · NEWPORT, N. J. · KLONDIKE, MO. · MILL CREEK, OKLA.

CIRCLE NO. 134, PAGE 69-70

AFS Casting Congress Housing Bureau Opens

■ Space for exhibits at the 1956 Castings Congress of the American Foundrymen's Society is just about gone, but reservations for hotel space for the Atlantic City event are just opening.

Applications for hotel rooms for AFS visitors to the 60th annual congress, May 3-9, will be accepted by the housing bureau of the Atlantic City Convention Bureau beginning February 1. All applications received by February 1, 1956, will be considered as of that date for assignment. The form included in this issue of MODERN CASTINGS should be used in applying for hotel space.

AFS has been assured of ample rooms and suites from the 14 major hotels in the neighborhood of the convention hall. However, little floor space in the convention hall is available for exhibitors. The official date for assignment of floor space found requests on file from 199 firms. These requests included about 95 per cent of the available floor space in the Atlantic City convention hall which is the largest in the world.

All proceedings of the congress and all exhibits will be in the convention hall. The tentative program for the AFS Congress has been announced and it details present planning for the technical program. A speaker of major importance will be presented at the annual banquet of the society, although the name of the speaker has not been announced. Numerous activities are planned for ladies attending the Castings Congress, but detailed plans have not yet been released.

Titles of technical papers to be presented at the congress have recently been released by several AFS technical committees including the Pearlitic Malleable Committee, Refractories Committee, Sand Division, and the Industrial Engineering and Cost Committee.

The pearlitic malleable group now plans to present a paper comparing mechanical properties obtained from air quenched and drawn, and reheated, liquid quenched, and drawn pearlitic malleable.

The refractories committee has announced that it plans to present topics on the following subjects: "Gun Placement of Refractories for the Cupola," "Air Furnace Refractories," "Survey on Refractories Consumption," and "Electric Furnace Rammed Roof Refractories."

AFS Sand Division has announced that the Sand Division Dinner will have as its topic a discussion of new developments in core blowing, discussing advantages and disadvantages of the various processes under the title, "Modern Methods of Core Blowing."

Papers presented by the industrial engineering and cost group will include the following titles: "Costs," "The Application of Statistical Quality Control in the Foundry," "Quality Control," and "Advantages of Incentives in a Small Jobbing Foundry." This committee will present the subject of "Human Relations" at its round table luncheon.

continued on page 29

Tentative Program . . . 60th American Foundrymen's Society Castings Congress

Atlantic City, May 3-9, 1956

THURSDAY, MAY 3

8:30 am ..... Registration Opens
9:00 am ..... NFFS Meetings
■ *Exhibits open 9:00 am - 5:30 pm*
12:00 noon ..... Author Luncheons: Gray Iron; Malleable; Sand
2:30 pm ..... Technical Sessions: Gray Iron; Malleable; Sand
7:00 pm ..... NFFS Dinner
8:00 pm ..... Gray Iron Shop Course

FRIDAY, MAY 4

8:00 am ..... Author Breakfasts: Brass & Bronze; Gray Iron; Malleable; Pattern; Light Metals; Sand; Plant Equipment
9:00 am ..... Technical Sessions: Brass & Bronze; Gray Iron; Malleable; Pattern
■ *Exhibits open 9:00 am - 5:30 pm*
12:00 noon ..... Round Table Luncheons; Brass & Bronze; Malleable; Gray Iron
2:30 pm ..... Technical Sessions; Light Metals; Plant Equipment; Sand
8:00 pm ..... Shop Courses: Gray Iron; Brass & Bronze

SATURDAY, MAY 5

"Atlantic Coast Day"

8:00 am ..... Author Breakfasts: Education; Industrial Engineering; Light Metals; Sand; Brass & Bronze; Malleable; Refractories
9:00 am ..... Technical Sessions: Education; Industrial Engineering; Light Metals; Sand
■ *Exhibits open 9:00 am - 12:00 noon*
12:00 noon ..... Annual Business Meeting Luncheon and C. E. Hoyt Lecture
■ *Exhibits open 2:00 - 5:30*
3:00 pm ..... Technical Sessions: Brass & Bronze; Refractories
Shop Course: Malleable
7:30 pm .....Annual Banquet

SUNDAY, MAY 6

■ *Exhibits closed*
8:00 am ..... Committee Breakfast Meetings
9:00 am ..... Committee Meetings
12:00 noon ..... Committee Luncheon Meetings
Past Presidents' Luncheon
2:30 pm ..... Committee Meetings
7:30 pm ..... Canadian Dinner

MONDAY, MAY 7

8:00 am ..... Author Breakfasts: Steel; Plant Equipment; Sand; Education; Light Metals; Gray Iron; Heat Transfer; Safety, Hygiene, and Air Pollution Control; Metallography Symposium
9:00 am ..... Technical Sessions: Plant Equipment, Steel, Sand
■ *Exhibits open 9:00 am - 5:30 pm*
12:00 noon ..... Round Table Luncheons; Education; Light Metals
Board Luncheon and Meeting
2:30 pm ..... Technical Sessions: Heat Transfer; Gray Iron; Light Metals; Safety, Hygiene and Air Pollution Control
7:30 pm ..... Alumni Dinner
8:00 pm ..... Sand Shop Course
Metallography Symposium

TUESDAY, MAY 8

8:00 am ..... Author Breakfasts; Heat Transfer; Industrial Engineering; Pattern; Gray Iron; Safety, Hygiene and Air Pollution Control; Steel; Light Metals; Management; Sand, Metallography Symposium
9:00 am ..... Technical Sessions: Heat Transfer; Industrial Engineering; Pattern; Gray Iron
■ *Exhibits open 9:00 am - 5:30 pm*
12:00 noon ..... Round Table Luncheons: Industrial Engineering; Pattern; Safety, Hygiene and Air Pollution Control
Light Metals
2:30 pm ..... Technical Sessions; Steel; Safety, Hygiene and Air Pollution Control
7:00 pm ..... Management Dinner
8:00 pm ..... Sand Shop Course
Metallography Symposium

WEDNESDAY, MAY 9

8:00 am ..... Author Breakfasts; Plant Equipment; Steel; Sand
9:00 am ..... Technical Sessions: Plant Equipment; Steel; Sand
12:00 noon ..... Round Table Luncheon: Steel
Registration closes 3:00 pm
■ *Exhibits close 5:30 pm*

Application for Housing Accommodations

AMERICAN FOUNDRYMEN'S SOCIETY
60th ANNUAL CASTINGS CONGRESS AND SHOW
ATLANTIC CITY, MAY 3-9, 1956

A.F.S. HOUSING BUREAU
16 Central Pier, Atlantic City, N. J.

Please make Hotel Reservations as shown below:

HOTEL .....First Choice HOTEL .....Third Choice

HOTEL .....Second Choice HOTEL .....Fourth Choice

No. Rooms with Bath:

.....Single Rooms for .....persons. Rate Preferred $.....

.....Twin Bedded Rooms for .....persons. Rate Preferred $.....

.....Twin Bedded Rooms Plus Parlor for .....persons. Rate Preferred $.....

.....Combination Rooms (2 Rooms, 1 Bath) for .....persons. Rate Preferred $.....

☐ I (We) Prefer Rooms Without Bath. Rate Preferred $.....

Arriving .....approx.....am.....pm Leaving May .....am.....pm.....

NOTICE: Room assignments will commence shortly after February 1, 1956, and will be assigned promptly in the order received after that date. Any application received prior to February 1 will be considered for assignment as of February 1.

YOU WILL RECEIVE CONFIRMATION DIRECT FROM THE HOTEL TO WHICH ASSIGNED AND NOT FROM THE HOUSING BUREAU.

THE NAME OF EACH HOTEL GUEST MUST BE LISTED

Please include the names of both persons for each twin bedded room requested. Also names of all persons for whom you are requesting reservations and who will occupy the rooms asked for:

....

....

....

....

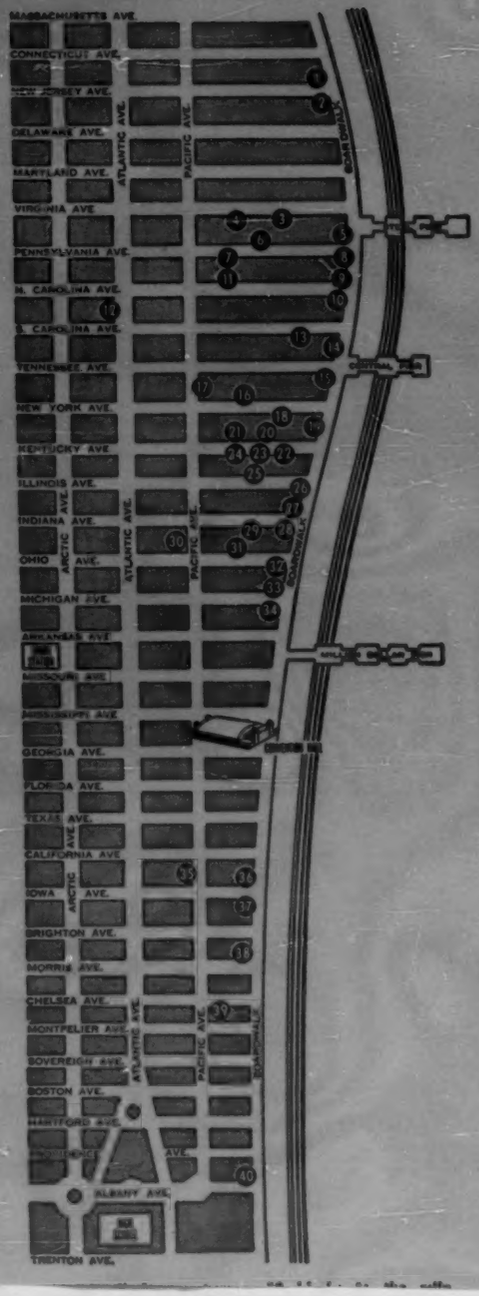
See reverse side for Atlantic City hotels and rates. Single rooms are limited in number. Please arrange to occupy twin-bedded rooms if possible. All reservations must be cleared through the Housing Bureau.

APPLICANT ..... TITLE .....

COMPANY .....

STREET ADDRESS .....

CITY ..... ZONE ....STATE.....



HOTEL LOCATION AND 1956 CONVENTION RATES

ATLANTIC CITY HOTELS

Key No.	HOTELS	Rooms with Bath		Two-Rooms—One Bath			Room with Parlor	
		Single	Double	2 Persons	3 Persons	4 Persons	Single	Double
37	Ambassador	6.00-16.00	8.00-22.00			16.00-28.00		20.00-45.00
1	Breakers	5.00-11.00	7.00-18.00		10.00-22.00	12.00-25.00		
28	Claridge	7.00-15.00	10.00-18.00					34.00
33	Dennis	7.00-12.00	10.00-22.00		18.00	22.00-32.00		35.00-45.00
32	Marlborough-Blenheim	7.00-10.00	10.00-20.00	15.00-17.00	16.00-20.00	18.00-22.00		27.00-36.00
15	Mayflower	6.00- 7.00	8.00-12.00		14.00-15.00	16.00-22.00		
14	New Belmont	4.00- 5.00	6.00-10.00		12.00-14.00	13.00-16.00		
40	President	5.00-10.00	8.00-15.00					13.00-24.00
36	Ritz-Carlton	6.00- 8.00	8.00-14.00			20.00		30.00
2	St. Charles	6.00-10.00	8.00-14.00			16.00		24.00-28.00
5	Seaside	7.00- 9.00	8.00-14.00		17.00			28.00
34	Shelburne	7.00-10.00	10.00-22.00		21.00-24.00			39.00-45.00
26	Traymore	6.00-16.00	8.00-24.00					20.00-45.00

AVENUE HOTELS

Key No.	HOTELS	Rooms with Bath		Two-Rooms—One Bath			Rooms without Bath	
		Single	Double	2 Persons	3 Persons	4 Persons	Single	Double
7	Colton Manor	7.00-10.00	9.00-14.00	12.00	15.00	18.00		
17	Columbus		6.00- 8.00			12.00-16.00		5.00- 6.00
29	Crillon*		8.00-12.00					
30	Eastbourne	5.00- 8.00	7.00-11.00	10.00-12.00	12.00-14.00	14.00-16.00	3.00-4.00	5.00- 6.00
16	Flanders	5.00- 6.00	7.00-10.00			16.00	4.00	6.00
11	Lafayette	6.00- 8.00	8.00-14.00	14.00		16.00-20.00	Parlor & 1 Double & Bath	18.00-24.00
25	Madison	6.00-12.00	7.00-14.00	10.00-18.00	12.00-20.00	14.00-22.00	4.00-6.00	6.00- 8.00
3	Morton	6.00	8.00-10.00					
12	Penn-Atlantic		7.00-10.00				3.00-4.00	5.00- 6.00
13	Senator	7.00-10.00	8.00-14.00	16.00-20.00		22.00	4.00	6.00

*Rate includes breakfast.

(The above rates are subject to 3% municipal tax)

CONGRESS POLICY

Entertainment. A.F.S. believes that a certain amount of relaxation and social activity is an accepted phase of any successful convention, but also believes that excessive or unlimited entertainment is detrimental to the best interests of the Society, the members, the Exhibitors themselves, and to the Foundry Industry as a whole. For this reason, the agreement between A.F.S. and Atlantic City hotels precludes the assignment of public space (i.e., ballrooms, large meeting rooms, and the like) for entertainment purposes, except between the hours of 5:30-7:00 p.m. To this end, the Society is requesting the cooperation of all Exhibitors alike in eliminating the "continuous open house" form of entertainment, especially during Exhibit and Program hours during Congress Week. Any other policy would be unfair to Authors, Committeemen, Session Chairmen, and the great majority of both Exhibitors and Visiting Foundrymen.

Hotel Signs. No directional or informative signs indicating the headquarters or events of firms or individuals attending the Congress will be permitted in lobbies, halls or corridors, or on hotel bulletin boards, except as may be specifically authorized by the Society.

Hotel Rates. The above rates are guaranteed convention rates applying during all convention periods and are agreed to by the Atlantic City Convention Bureau and the hotels named.

Hotel Exhibits. No sleeping rooms, suites, sample rooms or public space in Atlantic City hotels will be rented or permitted to be used for exhibit purposes during the Congress period.

This policy has been approved by the 1956 Exhibits Committee, composed of Exhibitor executives. The management of Atlantic City hotels have agreed to cooperate with the Officers of A.F.S. in abating unwarranted excessive entertainment which would compete with Society activities and in any way tend to defeat the purposes of the Congress.

continued from page 26

The AFS Safety, Hygiene and Air Pollution Control Committee has announced that it will present case histories of noise abatement and demonstrations of the causes and cures for harmful noise in the foundry. The same group will sponsor a management dinner.

All technical sessions will be held in the meeting rooms of the convention hall, with a maximum of four technical sessions scheduled for any one time. Round table discussions, however, will be scheduled for hotels rather than for the convention hall.

Two technical papers will be scheduled for presentation at each of the sessions. In addition, there will be nine informal round table sessions and six evening shop courses.

Additions to the list of exhibitors that appeared in MODERN CASTINGS last month are as follows:

Adams Co.
Aerodyne Development Corp.
Allis-Chalmers
Alloy Metal Abrasives
Alpha-Lux Co.
American Cystoscope Makers
Blastcrete Service Co.
Blaw Knox Co.
Borden Co.
Campbell-Hausfeld Co.
Cerro de Pasco Corp.
Clark Equipment Co.
Delhi Foundry Sand
Wm. Demmler & Bros.
Foxboro Co.
Girdler Co., Thermex Div.
Daniel Goff Co.
B. F. Goodrich
Great Lakes Carbon Corp.
Great Lakes Foundry Sand
International Graphite & Electrode Div., Speer Carbon Co.
Jarrell-Ash Co.
Liquid Carbonic Co.
Louthan Mfg. Co.
Lubri-Case, Inc.
Magie Bros.
J. S. McCormick Co.
Metals Disintegrating Co.
New Jersey Silica Sand
Nickey Brothers, Inc.
North American Smelting Co.
Parsons Engineering Corp.
Pekay Machine & Eng. Co.
Pressure Match Plate Co.
Ross Operating Valve Co.
Scientific Cast Products Corp.
Simplicity Engineering Co.
Sipi Metals Corp.
Solvay Process Div., Allied Chemical
Sterling Wheelbarrow Co.
Stroman Furnace & Eng. Co.
Taggart Brimfield Co.
Thiem Products, Inc.
Jervis B. Webb Co.
Whirl-Air-Flow Corp.

.....that's what the new king-size format of MODERN CASTINGS Magazine offers to every advertiser.

While all MODERN CASTINGS editorial matter is prepared and selected to be of direct benefit to readers, it is also arranged to be *useful* to MODERN CASTINGS advertisers!

By running editorial matter next to every advertisement, each page receives "bonus" reading time – without the usual "bonus" charge.

"Guaranteed Editorial Position at No Extra Cost" is just another reason why the new, bigger MODERN CASTINGS and American Foundryman is proving to be increasingly effective* in the casting market.

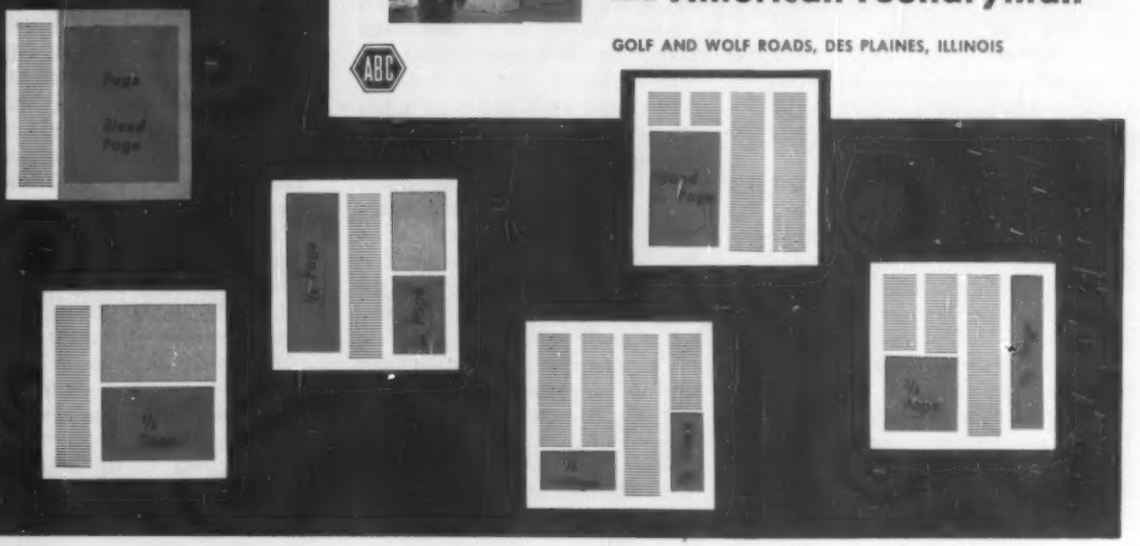
*85% increase in inquiries over a year ago.

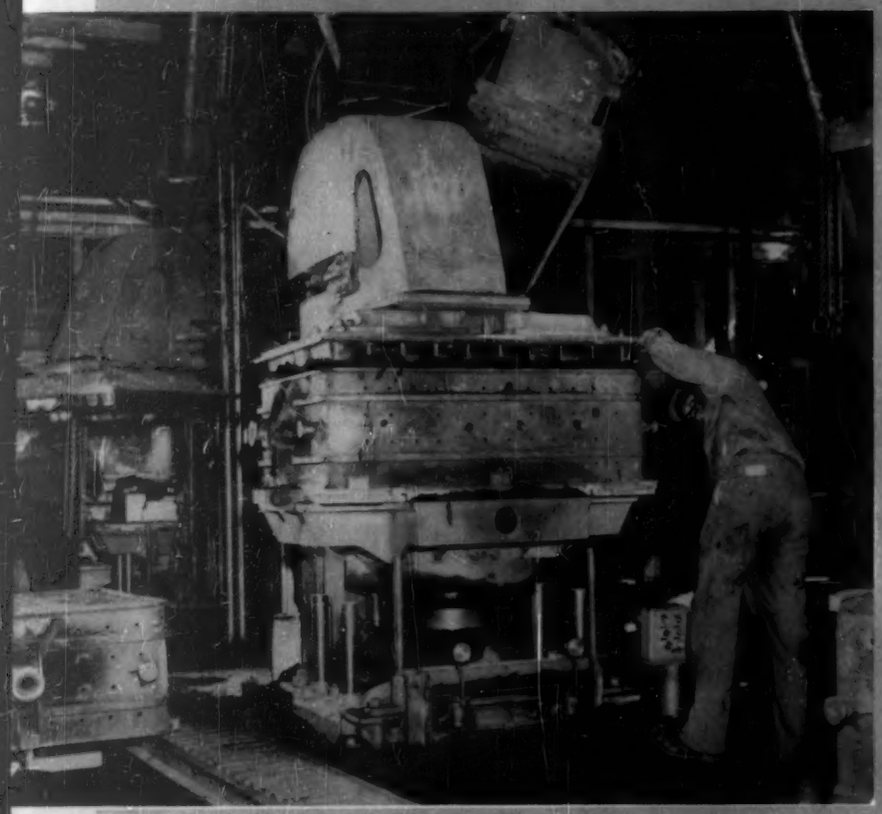
modern castings

***and* American Foundryman**

GOLF AND WOLF ROADS, DES PLAINES, ILLINOIS

ABC





DOES SAND TESTING GIVE US THE FACTS?

How to adapt laboratory sand ramming to production molding conditions

■ It is generally agreed that a mold made in the foundry by jolting and/or squeezing does not have sand physical properties that can be directly correlated with the values found in testing by the standard AFS test methods. Foundrymen, metallurgists and sand technicians have recognized these variations and our purpose is to offer a possible solution to closer correlation of these values.

AFS FOUNDRY SAND TESTING HANDBOOK, 1952 EDITION, outlines the standard methods of sample preparation. It points out that the sand in the specimen tube is rammed three times by dropping a 14-pound weight 2 inches. It has often been observed that the mold hardness developed on the sand specimen after ramming is generally quite different than the hardness developed by the same sand in the mold. Therefore, it is not only dangerous assumption to consider that sand test strengths directly relate to mold strengths, it can actually be shown that this is not true.

It is assumed that at equal mold hardness (test specimens versus sand in the mold) the properties of green strength, permeability, density, etc. of a given sand are similar—whether the hardness is achieved in a mold made on a jolt machine, or in a standard 2 inch AFS sand specimen made on the standard rammer. It can be shown that this assumption is reasonably true for a particular foundry sand. Thus, the mold hardness test should be a good basis for the desired correlation. Unfortunately, when a foundry sand is tested in the laboratory, it is commonly found to have a much higher mold hardness than can be achieved by jolting (and squeezing) on a molding machine.

The effect of ramming and jolting on mold hardness of a typical green sand is shown in Fig. 1. The jolting for Fig. 1 was performed on a machine having a 3 in. jolt travel, which corresponds to the jolt travel on many standard molding machines. Sand heights of 6 in. and 12 in. were used over a flat parting surface. Mold hardness measurements were made on the flat surfaces. Ramming was performed on the standard AFS sand specimen, using the AFS standard ramming device which has a 14 lb weight dropped 2 in.

Fig. 1 shows that mold hardness increases with number of jolts, but that a hardness is reached beyond which additional jolting produces little increase in hardness. This is a common experience in the foundry. The figure also shows that the mold hardness produced at the parting surface is greater when jolting with 12 in. of sand than with 6 inches of sand. The greater weight of a 12 in. sand height produces the higher hardness during jolting. With reference to Fig. 1, repeated ramming also causes mold hardness to increase to a maximum value.

However, Fig. 1 shows that the mold hardness achieved with the AFS rammer is much higher than that obtained from the jolt machine, regardless of the number of jolts. Each ram is a much more severe molding action than a jolt. The standard test of three rams is accompanied by a mold hardness of 93-94 for the sand. This hardness is not reached by jolting even after more than 50 jolts. Thus, the standard 14 lb, 2.0 in. drop, 3 ram test, does not produce properties of mold hardness, green strength, permeability, or sand density in the 2 in. specimen at all comparable to those obtained after the usual 10 to 20 jolts on a molding machine.

The question may now be asked:

J. S. SCHUMACHER / *Chief Engineer*
Hill & Griffith Co., Cincinnati

E. H. KING / *Vice-President*
Hill & Griffith Co., Cincinnati

R. W. HEINE / *Associate Professor*
University of Wisconsin, Madison

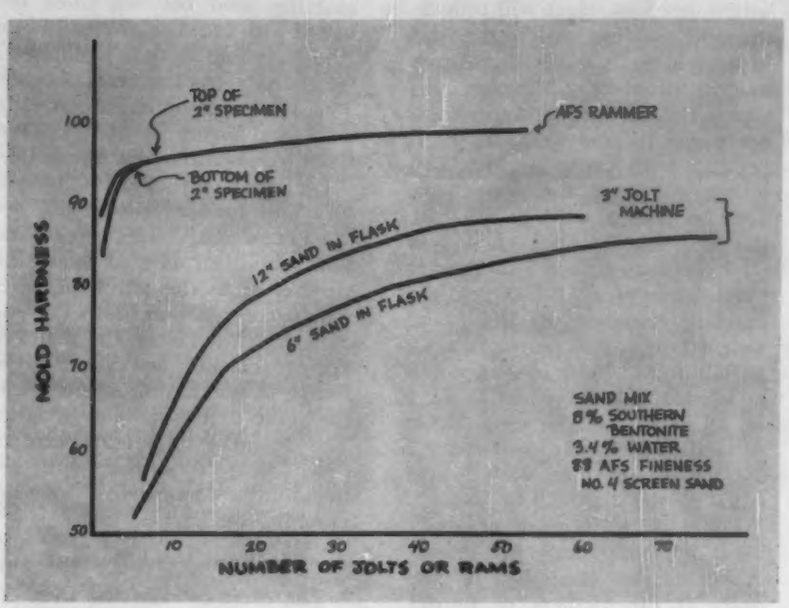


Fig. 1 . . A point is reached where mold hardnesses increase very little with additional jolts and standard test ramming can not be approached.

"What relationship should exist between ramming with the AFS testing device and jolting on a molding machine?" If the same work is done on the sand by both methods, equivalent sand density, mold hardness and other properties should be reached. Simple calculations based on physics can be used to relate ramming power and work done by the rammer weight for a 2 in. drop and the jolting power and work done on a molding machine. For the AFS rammer, the maximum work which can be done on the sand per ram is that equal to the kinetic energy of the rammer weight: or 14 lb x (2/12) ft = 2.335 ft-lb. However this work is done to a 2 in. high x 2 in. diameter specimen over an area of

$$\frac{\pi R^2}{144} = 0.0218 \text{ sq ft}$$

Thus, the work applied by the standard rammer weight is 2.335 ÷ 0.218 = 107.5 ft-lb per sq ft. Similarly, the maximum work which can be done by jolting is that equal to the kinetic energy of the *sand* when the jolt table strikes. For calculation, assume a sand column 12 in. high x 12 in. square; i.e. one cubic foot, and a sand density of 80 lb per cu ft. For a 3 in. jolt stroke, the kinetic energy of the cubic foot of sand would be 80 lb x 3/12 ft or 20 ft-lb. This work is applied to one square foot of area, so 20 ft-lb per sq ft work can be done per jolt to sand at the parting line. The jolt can do less than one-fifth as much work as the AFS rammer under the conditions described.

Rammer Too Heavy

To make the ramming conditions more like jolting, the weight of the rammer must be reduced. The work which could be done by different weights dropped 2 in. is given in Table 1.

Table 1 shows that a 2 to 3 lb weight dropped 2.0 inches would provide kinetic energy equivalent to jolting 12.0 inches of sand weighing 80 lb per cu ft with a 3.0 inch stroke. However, in molding,

TABLE 1 . . WORK ENERGY AVAILABLE FOR COMPACTING SAND WITH THE AFS RAMMER

Rammer Weight - lb	Energy on 2 in. diam. specimen - ft-lb per sq ft
14.0	107.5
6.0	46.05
4.0	30.7
3.0	23.0
2.0	15.35
1.0	7.67

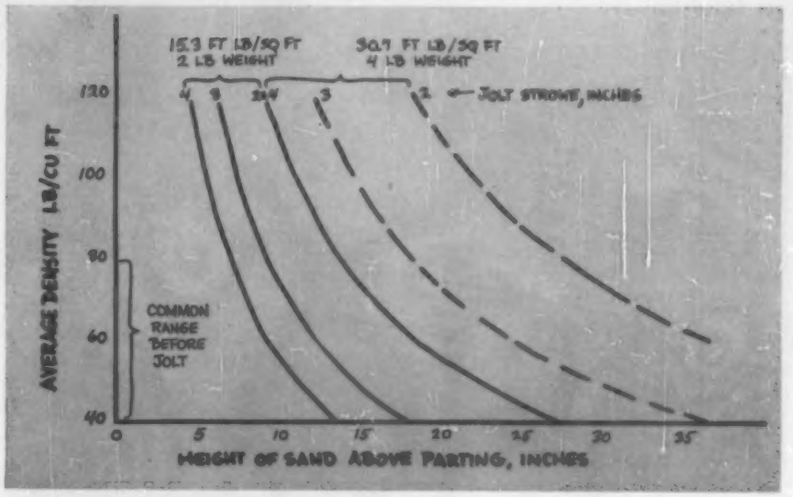


Fig. 2 . . Jolting energy comparable to that of 2 and 4-lb test rammers.

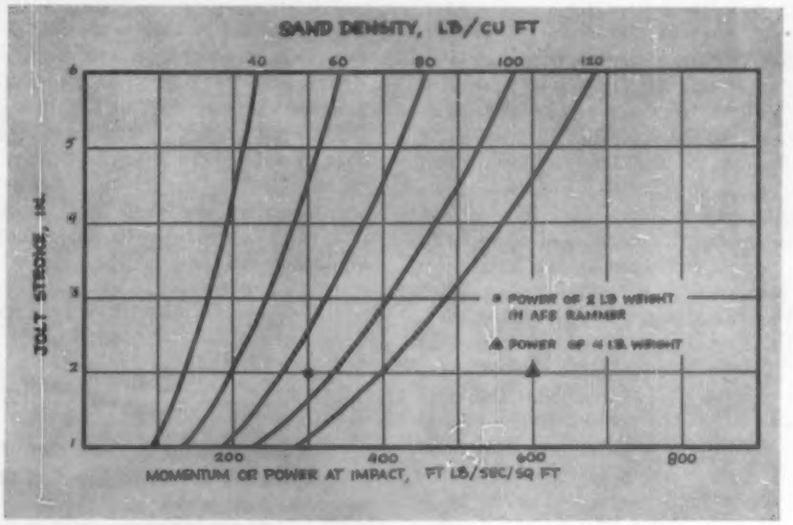

SAND DENSITY, LB/CU FT
JOLT STROKE, IN.
POWER OF 2 LB WEIGHT IN AFS RAMMER
POWER OF 4 LB WEIGHT
MOMENTUM OR POWER AT IMPACT, FT LB/SEC/SQ FT

Fig. 3 . . Power on 12-in. sand column base as function of jolt stroke.

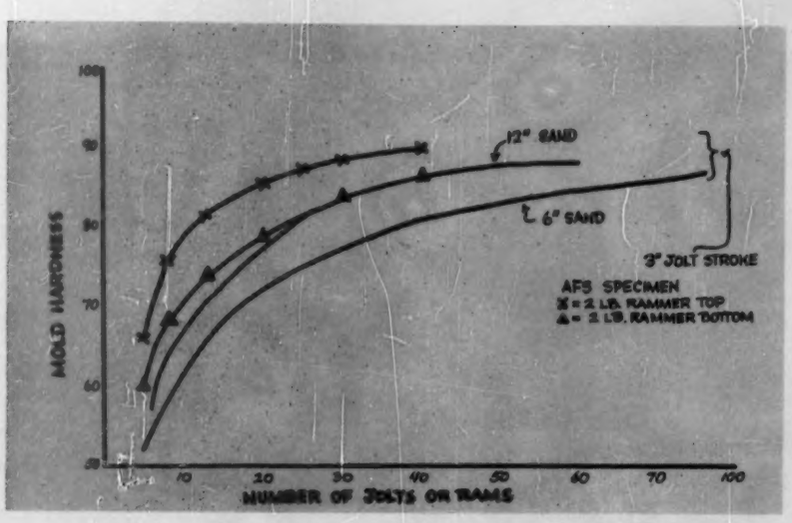


Fig. 4 . . 2-lb weight ramming compared with jolted parting hardness.

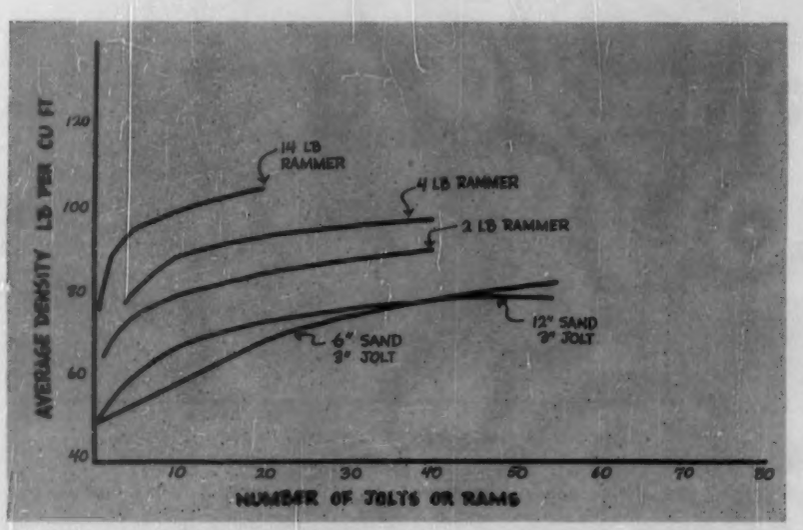


Fig. 5 . . Molding sand compaction indicated by average sand density.

the jolting energy is subject to two variables, the jolt stroke and sand weight. The jolt stroke is dependent on the molding machine. The weight of the sand is determined by its height in the flask and its density in lb per cu ft before jolting begins. Densities of 40 to 80 lb per cu ft before jolting have been observed in different sands studied by the authors. To give an equivalent molding effect, the ramming weight must provide the same energy as is obtained from the combination of sand weight (sand height and density) and jolt stroke.

Ramming energy is expressed by $\frac{WxR}{A}$ ft-lb per sq ft where W is the rammer weight, R is dropping distance of 2/12 ft. and A is the area of the specimen of 0.0218 sq ft. Jolting energy is expressed by D x H x J, where D is the density of the sand in lb per cu ft, H is the height of the sand in ft, and J is the jolt stroke in ft. For equal molding work:

$$\frac{W \times R}{A} = D \times H \times J$$

or

$$\frac{W \times 2}{0.0218 \times 12} = \frac{D \times H \times J}{12 \times 12}$$

The relationship of these factors is graphically shown in Fig. 2. For a given jolt stroke, the curves relate density of molding sand and its height in a flask which will provide the same molding work to the sand in a mold as 2 and 4 lb rammer weights dropped 2.0 inches will give to the standard sand specimen. For example, sand weighing 60 lb per cu ft with a sand height of 12.0 inches will have the same work done on it in a mold by a 3.0 in. jolt as would be done on a 2 in sand specimen by the 2 lb rammer weight, dropping 2.0 inches in the standard rammer. If the sand weighed only 40 lb per cu ft, a 4.0 in. jolt and 13.75 in. of sand would be needed for work equal to the 2 lb, 2.0 in. ram. About seven inches of sand at 80 lb per cu ft and 4.0 in. jolt would give work energy equal to the 2 lb, 2.0 in. ram.

Power is a measure of doing work in foot-pounds per second. A jolt or ram is applied instaneously at the moment of impact. However, time is required to compact the sand. Thus, a comparison of the power developed by jolting and ramming is in order. In either case, the power is defined by the momentum (mass and velocity) of the ram weight or sand weight per unit area at the instant of impact. For a 2 lb weight dropped 2.0 inches, power is calculated as follows:

MxV ÷ A = Power for sand compaction per unit area

$V = \sqrt{2gd}$

$V = \sqrt{2 \times 32.2 \text{ ft/sec}^2 \times 2/12 \text{ ft}}$

V = 2.32 ft/sec

A = 0.0218 sq ft surface area of 2.0 in. diam. specimen.

2 lb x 2.32 ft/sec ÷ 0.0218 sq ft = 30 ft-lb per sec per sq ft

Similar calculations can be made for each rammer weight, or jolting combination of sand weight and jolt stroke. The power factors are summarized in Fig. 3.

From Fig. 3 it is evident the 3.0 in. jolt stroke acting on 12.0 in. of sand weighing 80 lb per cu ft develops slightly more power than the 2 lb-2.0 in ram. Jolting a sand weighing only 60 lb per cu ft under these conditions would develop less power than the 2 lb-2.0 in. ram. Power developed by the 14 lb-2.0 in. ram is completely outside the limits of the graph.

Considering the principles described above, it is no wonder that good correlation of properties of molding sand between those obtained with the standard AFS 14 lb-2 in. ram and by jolt molding in the foundry has not been possible. The 14 lb weight has a ramming work and power of five to seven times that encountered in practice.

For exact correlation of laboratory and foundry properties, the rammer weight-distance combination should be selected to do the same work as the jolt stroke-sand weight combination. This may be done with the aid of Fig. 2 and 3. For convenience, however, it is desirable to standardize on one or at the most a few rammer weights. The 2 and 4 lb weights seem to cover most conditions and are therefore recommended for the ramming device.

2-lb Ram Mold Hardness

The effect of ramming with the 2 lb weight on mold hardness and comparison with mold hardness obtained by a 3.0 in. jolting is shown in Fig. 4. The same sand was used as for Fig. 1. Correlation of mold hardness with number of jolts and rams is much better for a 2 lb-2.0 in. ram than for the 14 lb-2.0 in. ram. This is demonstrated by a comparison of Fig. 1 and 4. However, even the 2 lb weight produces somewhat higher hardness than is obtained with a 3.0 in. jolting. This is necessarily so in this case, because of the low starting density of this sand, 49 lb per cu ft. Reference to Fig. 2 and 3 show that 12.0 in. of sand at a density of 49 lb per cu ft will not do as much work or provide as much power with a 3.0 in. jolt as the 2 lb-2.0 in. ram. Therefore, a slightly lower hardness would be expected from a 3.0 in. jolting. Four inch jolting, however, should produce higher hardness than 2 lb-2.0 in. ramming.

Sand Density Comparison

Average sand density is another means of studying the compactions of sand which occur during molding. Fig. 5 shows how the density of a molding sand is affected by ramming and jolting. A comparison is made of the effects of 2, 4 and 14 lb ram weights, and jolting with a 3.0 in. stroke a sand column 12.0 or 6.0 in. high of 49.0 lb per cu ft initial density. The sand employed was the one also used for Fig. 1 and 4. Again, the 2 lb-2.0 in. ram pro-

vides a much closer correlation of density with jolting. The 14 lb-2.0 in. ram is completely unrealistic in this comparison. Even the 2 lb weight produces higher average density than 3.0 in. jolt with 12.0 in. in height of this sand. Again, this is caused by the low starting density of the sand and a consequently lower applied power and resultant work.

Other sands with higher starting density show even closer correlation of jolting with 2 lb-2.0 in. ramming. Moisture content, clay type and amount, and additions, all influence the starting density of the sand before jolting. Experience with a variety of sands shows that the 2 lb-2.0 in. ram provides a reasonable comparison with the 3.0 in. jolt and a 4 lb-2.0 in. ram compares with a 4 to 4.5 in. jolt.

With respect to density, there is a fundamental difference between the AFS ramming tests and jolting. The ramming procedure produces a fairly uniform density because the sand is confined in a tube. Still, density (and mold hardness) are maximum at the surface of impact. The higher the average density of the 2 in. specimen, the more uniform its density is; while the lower its average density, the greater the difference in density from top to bottom. This is the reason for the greater difference of top and bottom mold hardness with the 2 lb-2.0 in. ram (Fig. 4) compared with the 14 lb-2.0 in. ram (Fig. 1). Jolting produces a density gradient with high density at the parting (impact) surface and low density near the surface away from the parting. Fig. 5 shows only average density values.

Since the 2 lb-2.0 in. ram produces more of a density gradient (and top and bottom hardness difference) it again more closely simulates a jolting effect. Properties such as permeability, green strength, dry strength, hot strengths, etc. are affected both by average density and density gradient. It should be obvious that a laboratory sand specimen rammed to a high and uniform density by a 14 lb-2.0 in. ram has much higher green strength and far lower permeability than the same sand jolted on a mold to a lower average density with the density decreasing away from the parting. Thus, for correlation of sand properties obtained in the laboratory with those existing in a mold, 2 lb-2.0 in. ram and 4 lb-2.0 in. ram procedures are recommended. The number of rams should correspond to the number of equivalent jolts used in the foundry.

For comparison purposes, a standard of 15 rams and jolts is suggested, although individual foundry practices may indicate a higher or lower figure.

Conclusion: Our results do not imply a rejection of the 14.0 lb-2 in. ram procedure. The latter provides a useful means of comparing the properties of sand at high density, where the data are most reproducible, are least affected by non-uniform density, and the ultimate bonding properties and minimum permeability of the sand may be determined. However, the 14 lb-2.0 in. ram does not produce a molding condition comparable to that of the jolt-squeeze machine, and should not be used for correlation of sand properties in the laboratory and foundry. The two and four pound weights with 2.0 in. drop are recommended, to better correlate foundry results with laboratory control data.

This paper will be presented at a Sand session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9. Written discussion should be sent to the American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill.

AFS Library Growing Fast

Expansion of the American Foundrymen's Society's Technical Library is indicated by reviewing the titles of the 180 volumes added during the past year.

Topics covered by new books include: foundry practice, cost and organization, automation, plant layout, maintenance, sanitation, drawing and design, non-destructive testing, metallurgy, technical societies' transactions, handbooks, and library aid books.

Although the growing library is invaluable to the operation of the Technical Center, it also offers Society members the benefits of reference service. Requests for technical information or sources of it will be given prompt attention by the Society's Technical Department.

Release Wisconsin Regional Program

■ Management, pattern men, metallurgists, engineers and foundrymen will discuss foundry problems and equipment at the 19th annual regional foundry conference sponsored by the Wisconsin Chapter, American Foundrymen's Society, and the University of Wisconsin.

The conference will be held February 9-10 at the Hotel Schroeder, Milwaukee, under the direc-

George J. Barker

of Conference Chairman, George J. Barker, University of Wisconsin. Professor Barker will be assisted by N. N. Amrhein, Federal Malleable Co., co-chairman; L. J. Woehlke, Grede Foundries, Inc., program chairman; and L. F. Kreuger, ticket chairman.

THURSDAY, FEBRUARY 9

9:00 am . . REGISTRATION

10:00 am . . WELCOMING ADDRESS, Dean Kurt F. Wendt, University of Wisconsin.

10:40 am . . GENERAL MEETING. *"Noise, A Problem in Industry,"* Herbert J. Weber, Safety, Hygiene and Air Pollution Control director, AFS.

12:00 . . LUNCHEON. *"Football—Past and Future,"* Milton Bruhn, coach, University of Wisconsin.

2:15 pm . . SECTIONAL MEETINGS

MALLEABLE, *"Processing of Pearlitic Malleable,"* Lyle R. Jenkins, Wagner Malleable Iron Co.

NON-FERROUS, *"Effect of Gating Design on Casting Quality,"* Hans J. Heine, technical director, AFS.

GRAY IRON, *"Metallography of Cast Iron,"* Philip C. Rosenthal, University of Wisconsin.

STEEL, *"Casting Surface, Finish, Tolerance and Precision,"* Clyde A. Sanders, American Colloid Co.

PATTERN, *"Epoxy Plastic Pattern Equipment,"* Martin C. Ehrman, International Harvester Co.

4:00 pm . . SECTIONAL MEETINGS

MALLEABLE, *"Casting Scrap Due to Cores: Cause and Cure,"* R. J. Mulligan, Archer-Daniels-Midland Co.

NON-FERROUS, *"Synthetic Sand Practice,"* Victor M. Rowell, Harry W. Dietert Co.

GRAY IRON, *"New Developments in Melting Equipment,"* H. W. Schwengel, Modern Equipment Co.

STEEL, *"Welding in the Foundry,"* W. G. Rinehart, Harnischfeger Corp.

PATTERN, *"Pattern Design Specifications,"* E. A. McClintock, Belle City Malleable Iron Co.

6:30 pm . . BANQUET. *"A Management Is As Good As Its Words,"* Dr. Charles E. Irvin, Michigan State University.

FRIDAY, FEBRUARY 10

10:00 am . . SECTIONAL MEETINGS

MALLEABLE, *"The Duplex Method of Melting,"* Eric Welander, John Deere Malleable Works of Deere & Co.

NON-FERROUS, *"Brass and Bronze Foundry Practice Emphasizing Quality and Quality Control,"* F. L. Riddell, H. Kramer & Co.

GRAY IRON, *"Gating and Risering,"* Harry H. Kessler, Sorbo-Mat Process Engineers.

STEEL, *"Magnetic Particle Inspection of Steel Castings,"* R. O. Schiebel, Magnaflux Corp.

PATTERN, *"Production Pattern Equipment as Used at Caterpillar Tractor Co.,"* Robert L. Selberg, Caterpillar Tractor Co.

12:00 . . LUNCHEON. Speaker to be announced.

2:15 pm . . SECTIONAL MEETINGS

MALLEABLE, *"Scrap Reduction Methods,"* C. F. Semrau, Hill & Griffith Co.

NON-FERROUS, Information Panel: Hans J. Heine, F. L. Riddell, Victor Rowell.

GRAY IRON, *"Almost Every Foundry Can Have Improved Sand,"* Earl E. Woodliff, Foundry Sand Service Engineering Co.

STEEL, *"Deoxidation of Steel for Castings,"* F. W. Boulger, Battelle Memorial Institute.

PATTERN, *"Pattern Equipment for Shell Molds and Shell Cores,"* H. Weaver, Brillion Iron Works.

Advance registration may be made through Bradley H. Booth, Carpenter Bros. Inc., 606 W. Wisconsin Ave., Milwaukee 3.

DIRECT ARC FURNACE DOUBLES in BRONZE

T. R. STANLEY/*Foundry Supt.*
Consolidated Mining & Smelting Co. of Canada
Trail, British Columbia

Small captive bronze shop uses steel melting facilities for 5000-lb castings

■ A direct arc furnace in the foundry of Consolidated Mining & Smelting Co. of Canada is doubling up by melting both steel and bronze.

Cominco's foundry produces castings used in maintaining the company's plants. A great deal of bronze is used in the company's electrolytic plants and castings in these areas are subject to severe corrosion and must be replaced to maintain plant efficiency.

Discarded castings are remelted and the metal used to make new ones. Since some of these weigh from 4000 to 5000 lb, they present a major melting problem for a foundry geared to produce bronze castings in the one lb to five hundred lb range using an 1800 lb capacity carbon resister electric furnace.

However, facilities are available in the same shop for melting up to 25,000 lb of steel, and experience has shown that bronze can be melted very satisfactorily in either of the two direct arc electric steel melting units. Furthermore, it has been found that melting a large batch of heterogeneous bronze scrap, refining it, then casting it into ingots of known composition works very well. No virgin metal other than tin, has been used in the foundry for more than ten years.

Intricate sundial and 4 ft diam ring were cast of bronze.

Produces Quality

Bronze melted in the direct arc-type electric furnace is of high quality having better than normal strength and density. The high density aggravates the solidification shrinkage problem to some extent so care must be taken to provide adequate risers and to use chills on remote heavy sections.

The 2000 Kva direct arc furnace used for large bronze heats normally operates twenty hours per day melting steel and cast iron. The change-over for bronze and back again for ferrous metals necessitates some special precautions to avoid intercontamination from heat to heat. The procedure used to get a heat of bronze follows.

Furnace preparation begins two heats before the bronze heat is to be charged. The furnace is thoroughly drained, then the bottom is carefully patched and reshaped so that no low spots remain. The same procedure is used with the subsequent heat as an added assurance against pools or pockets of steel being retained in the furnace to contaminate the bronze heat and prolong the purification treatment. A true hearth contour facilitates complete drainage and prevents bronze from damaging the following ferrous heat.

In spite of such precautions, the ferrous heat melted after a bronze one usually picks up enough nonferrous impurities to reduce the dynamic properties of steel. Iron is not much affected. Cominco's practice is normally a batch of bronze, followed by one of iron for ball mill grinding balls. Here such impurities appear to be beneficial if they have any noticeable effect.

A bronze charge may consist of borings, turnings, floor sweepings, gates, risers and pieces of scrap from an ounce to several tons. Pieces of copper five feet square and a foot thick, which resulted from an accidental reverberatory furnace run-out at a copper refinery many years ago, have been successfully charged and melted. Very large pieces of scrap are charged first, then covered with smaller pieces.

It is customary to add some oxidizing compound with the charge to reduce the refining time. Manganese ore is used for lead-free alloys. Where some lead is permissible in the alloy, scrap lightning arrester discs containing lead peroxide are placed near the bottom of the charge. These are an excellent fluxing material since the porcelain ring provides slag, the lead peroxide supplies oxygen and the copper and lead are recovered without prior salvage separation.

When the charge is melted, the bath temperature is raised to 2400 F, a ceramic coated air pipe is run through the door of the furnace, then air is blown over the surface of the bath to remove impurities. Iron, phosphorus, aluminum and gases are usually present and must be reduced below their allowable limits. Spoon tests are poured at 3 to 5 minute intervals. Blowing is continued until test bars have a smooth surface free from sprouts. The slag is then raked off to be replaced with just enough new slag to cover the surface. Some silicomanganese is used to partially deoxidize the metal, followed by phosphor copper to complete the deoxidation.

Test bars poured in green sand molds are used to determine when the metal is ready for pouring. These must have a pronounced pipe in the 1½-inch diameter, four-inch deep slug, and a uniform, flake-free fracture on a one-inch by one-half inch wedge bar. At this stage, the metal may be too hot for pouring. If so, it may be held in the furnace until it has cooled to the desired temperature or, alternatively, held in a ladle which has been dried at a red heat.

The high temperatures reached in the furnace for refining purposes do not appear to have any bad effect on the metal. Alloys such as

"ounce metal," which contain zinc, are not blown with air, nor is any other attempt made to remove iron. There seems to be enough action or ebullition in the bath to degas the metal.

Bronze alloys, particularly "gun metal" (90% Cu, 10% Sn), when melted electrically, have good physical properties though soundness and density are usually of more consequence when castings are made of gun metal. On the other hand, "ounce metal" (5% Sn, 5% Zn, 5% Pb, 1% Ni, 84% Cu) must, as a rule, meet specific physical requirements. Metal melted as described above, generally has a tensile strength of from 36,000 to 42,000 psi when made from an all scrap charge. Elongation and reduction of area is usually over 25 per cent. Table 1 shows inspection results of actual heats of bronze from the direct arc furnace. Zinc oxide tends to condense around the electrode ports, the spout and door. It is not advisable to operate at temperatures in excess of 2800 F when much zinc (30 per cent or more) is present. Zinc vapor can puff through the furnace openings when least expected, to ignite with a long white flame much like a military flame thrower and with much the same effect.

Cost is Less

The cost of melting bronze by direct arc furnace at Cominco is much less than that using oil or coke. Power consumption runs from 150 kw-hr to 250 kw-hr per ton, depending on the refining time required to purify the metal. Relatively clean metal charged into a hot furnace will seldom require more than 180 kw-hr per ton. No figures are available for electrode consumption because not enough consecutive heats have been run to use a measurable quantity of electrodes. The utilization of existing electric melting equipment has avoided the additional capital cost of a reverberatory furnace to be used exclusively for bronze.

The electrical design and transformer hook-up on the furnaces provide appreciable reactance for the 190 volt and 175 volt taps only. Though taps as low as 90 volts are available, these have no additional reactance in series and the inherent reactance of the transformer is not enough for satisfactory melting. For this reason, the melting voltages used are the same as for steel.

The 1800 lb capacity carbon resister furnace, used for the daily production of small bronze castings, operates with an atmosphere which, though free from sulphur and hydrogen, is always reducing. It is, therefore, necessary when using an all scrap charge, to provide solid oxidizing compounds to avoid gas porosity in the castings. This is not necessary when the scrap has been melted and treated in a direct arc furnace, then cast into ingots. For this reason extra metal is melted when it is necessary to make a heat of bronze in the direct arc furnace. The extra metal is pigged for future use in the resister furnace.

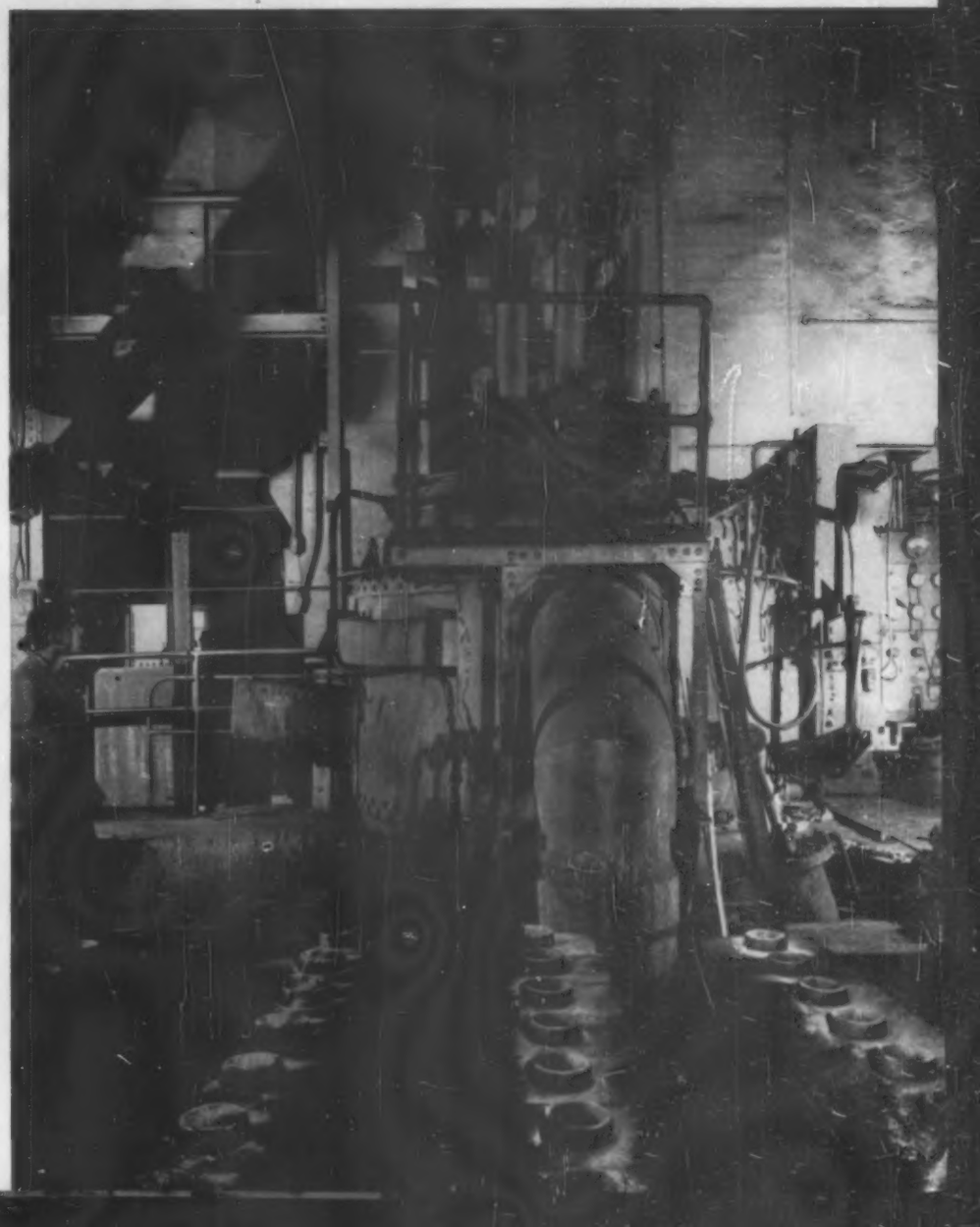
In the past, the direct-arc electric furnace has been generally considered too hot to handle non-ferrous metals such as bronze. Although it is true that certain precautions and due care must be taken, it is evident that the direct-arc furnace can handle bronze and do it well.

TABLE 1 . . PHYSICAL PROPERTIES OF DIRECT-ARC-MELTED BRONZE

Reference No	Pouring Temp	Tensile Strength	Elongation	Reduction of Area
3063	1910F	40,650ps.	27.3%	28.0%
3064	2100	40,000	32.1	29.0
3068	1960	36,800	16.4	23.0
3069	2000	37,600	23.1	23.0
3070	2060	37,750	23.8	28.5
3073	1970	38,500	25.7	22.8
3081	1980	40,200	31.1	33.5
2992	—	42,600	37.5	29.0
2988	—	41,500	28.1	28.5
2994	—	42,000	31.0	29.0
3012	—	40,250	26.6	34.0
3025	—	42,200	34.0	29.0
Specification		36,000	8.0	—

Bronze pump castings require only a small amount of finish grinding.

Furnace hood exhausts fumes of bronze melting and refining operations.



WHAT YOU SHOULD KNOW

About the Proposed Model Workmen's Compensation Law

It will affect you if this proposed model workmen's compensation law is adopted by your state

H. J. WEBER / *Director of Safety, Hygiene, & Air Pollution Control, American Foundrymen's Society*

■ A "discussion draft" of a workmen's compensation law has been prepared by the United States Department of Labor to serve as a model for the states to follow. Comments on the model law are solicited, Under Secretary of Labor Arthur Larson said in an address before the Industrial Hygiene Foundation November 17.

Highlights of the proposed model law include:

■ **Hearing loss.** The law rules out any temporary total or temporary partial loss of hearing: only permanent total or permanent loss of hearing would be compensable.

No claim could be filed until six months after termination of exposure to allegedly harmful noise. Reason for cessation of employment would make no difference, thus an employee may file a claim six months after retirement.

Any employer for whom the employee has worked for at least 90 days and whose employment contributed to any extent to the deafness is made fully liable. But the employee may sue any other employer whose employment contributed, and they will bear the cost equally unless the evidence warrants a different apportionment.

It is known that there is some recovery of hearing after removal from exposure. By delaying compensation for six months, a more valid measure of hearing loss may be made.

■ Complete copy of the proposed model workmen's compensation law can be obtained from: Arthur Larson, Under Secretary, U. S. Department of Labor, Washington 25, D. C.

■ Foundrymen are urged to secure a copy of the discussion draft of this proposed model for states to follow if they desire (it's not a proposed Federal law) and express their opinions on it to Under Secretary Larson.

■ **Second-injury fund.** The model law has phrased the second-injury fund section so that an employer will not be penalized for hiring physically handicapped people. Under the usual no-apportionment rule, the employer who hired a one-eyed man had to pay the entire cost of total blindness when that man lost his good eye in a work-connected injury. It is reported that between 7000 and 8000 physically handicapped lost their jobs in Oklahoma within 30 days after the case of Nease vs. Hughes Stone Co,. announced the no-apportionment rule in Oklahoma.

■ **Extraterritoriality.** Lack of uniformity in state laws on extraterritorial coverage produces two maladjustments — sometimes several state acts apply to the same injury, and sometimes no act applies. Here are two examples:

THE MCCARTIN CASE. The court held that a claimant, after receiving an award in Illinois, could thereafter also get an award in Wisconsin where the benefits were higher, for the difference between the Illinois and Wisconsin benefits, since the acts of both states happened to apply.

HOUSE VS. STATE INDUSTRIAL ACCIDENT COMMISSION. The deceased was hired in Oregon by an Oregon company, and was sent to manage a branch office in California. He was called to Oregon to attend a dealers' meeting, and in the course of this temporary visit was accidentally killed in Oregon. California requires the place of contract to be in California, for an out-of-state injury, and Oregon requires the place of regular employment to be in Oregon. In this clearly compensable case, compensation was first denied in California, and subsequently in Oregon.

The model law proposed would apply to the injury or death of an employee of an employer who carries on employment in the state, irrespective of the place where the injury or death occurs.

■ **Arising out of employment.** Compensation laws now require that an injury must "arise out of *and in the course of employment.*" The model law proposes to delete the phrase "and in the course of." Why? Here are some examples:

A foreman fires an employee. The disgruntled employee meets the foreman at the beach the following Sunday and smashes a pop bottle on the foreman's head.

An employee continues to go to work during a strike to help his employer avoid losses due to lack of maintenance. The employee is assaulted by strikers at his home.

A self-imagined creditor of the employer kills, away from the plant and outside hours, a fiscal employee who refuses to pay on behalf of the employer.

A banana handler gets a tarantula in his pants at work. The poisonous spider inconsiderately waits until after business hours to bite.

All of these cases arose out of, but not in the course of, employment and are therefore not compensable. Under the model law they would be.

■ **Violation of safety rules.** It is proposed that a worker be penalized by a 15 per cent decrease in compensation for violation of safety rules or for failure to use safety devices. And that the employer be penalized by a 15 per cent increase in compensation for failure to provide safety devices.

EDWARD D. BOYLE
Consultant
Bremerton, Wash.

New and used sand from separate bins are weighed electronically and automatically in load-cell weigh hopper.

Small Load Cells Weigh Sand Electrically, Accurately, Instantaneously

One of earliest strain gauge weighing installations puts test instrument to new use

■ When the sand handling system at the Puget Sound Naval Shipyard was modernized, naval design engineers recommended the use of load cells for weighing. The cells, along with relocation of sand bins and improved unloading facilities, have speeded sand handling and eliminated possibilities of weighing errors.

A load cell measures weight by means of four strain gauges attached to a short steel column. They indicate, by means of minute changes in electrical resistance, deformation in the column. The deformation is proportional to the weight on the load cell.

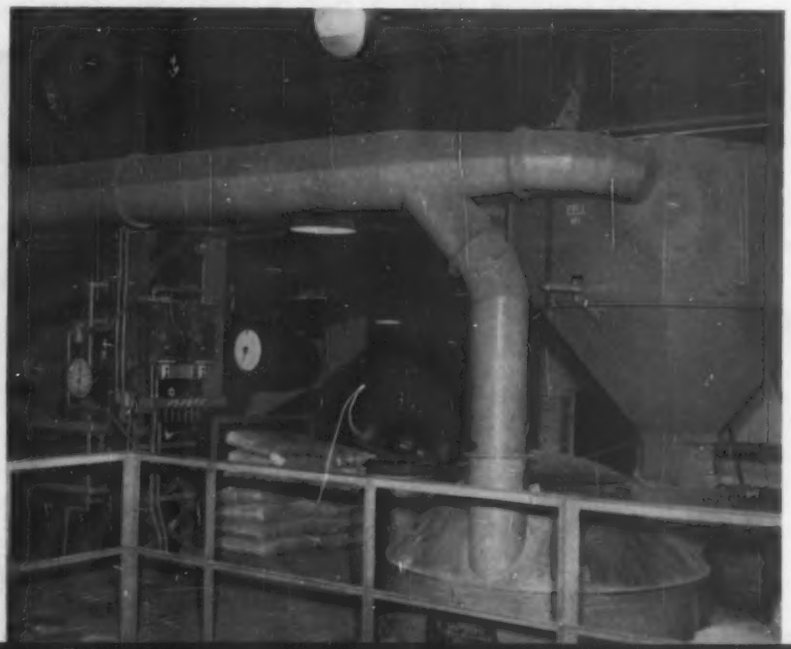
To simplify sand handling, the muller was moved to a point more accessible by crane. Sand storage was relocated above and near the muller. Sand unloading was changed from three men and a long-boom diesel crane to one man and a front-end loader dumping directly into a track-side bucket elevator. The elevator discharges into the 4-car bin over the sand preparation area.

Used sand from the mechanical shakeout is elevated into a crusher and screener which discharge into a second 4-car storage hopper.

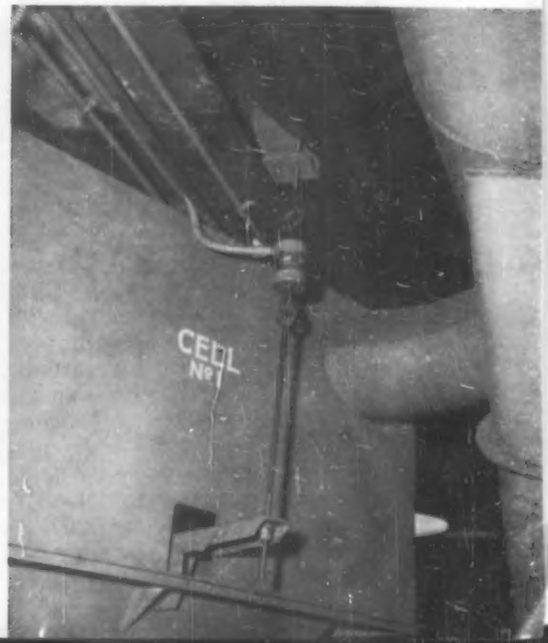
Sand is transferred by belt conveyors from the two storage bins to the weigh bin over the muller. The muller operator can secure any proportion of new and used sand required in the mix. He merely sets his control, pushes the button, and the conveyor delivers sand until the desired weight of new or used sand is in the weigh hopper. Then the conveyor stops automatically.

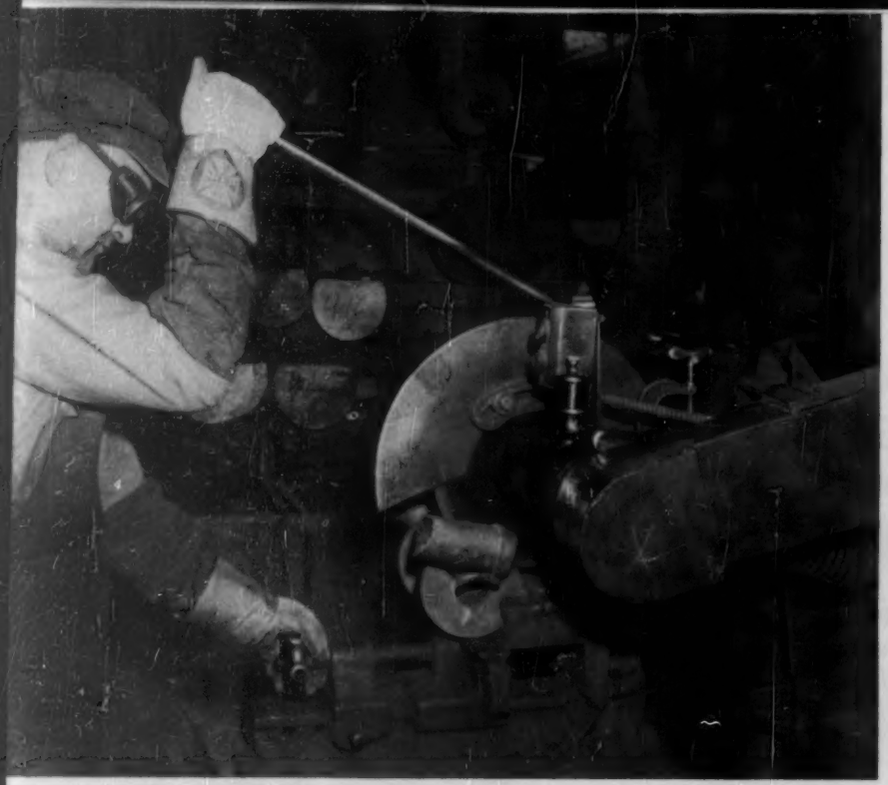
There is no chance for the operator to err in weighing the proper amount of sand.

Merely pushing a button on remote controls initiates a preset mix.



Load cell supporting arrangement.





Lasting accident prevention requires more than mere safety devices.

SAFETY: It's No Accident!

Here's how to get your accident frequency down to 78 per cent below the national foundry average

CHARLES H. ELSBY / *Accident Prevention Bureau Mgr.*
Employers Mutuals of Wausau
Milwaukee Branch

■ Virtually every industrial plant in the country carries out some kind of accident prevention activities. Some are successful. Some aren't. Why the difference?

While there is no out-and-out pat answer to this question, many years of experience have taught us that certain conditions must exist before accident prevention has any chance to do the job it is intended to do: We must have both the unquestioned interest of top management and imaginative and persistent people to stimulate effective action. Given these two ingredients an accident control system can achieve remarkable success.

One of the outstanding examples of this approach to industrial safety concerns the record of Waukesha Foundry Co., just outside of Milwaukee. Last year the plant operated at a lost-time accident frequency rate of 3.2 accidents per million man-hours—78 per cent below the national foundry average of 14.8! Over the past six years, Waukesha Foundry has achieved an average frequency rate of only 8.4—just over eight lost-time injuries for each million man hours worked.

In addition, the company operates a similar plant in nearby Watertown which has experienced but one lost time accident in the past three years. About 90 persons are employed there.

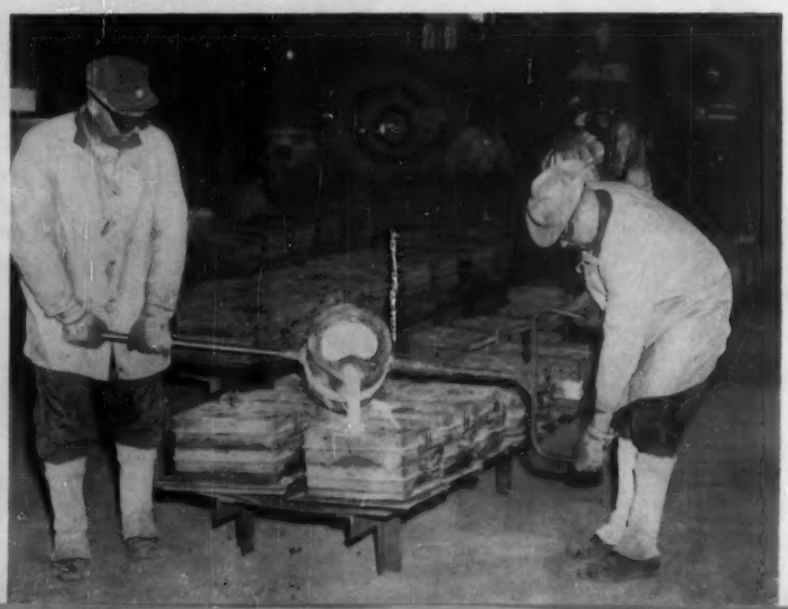
These spectacular results were gained in an unspectacular manner. That's the way it is with most good safety performance, I've found. The systems that work the best involve long-range planning coupled with tough day-to-day execution, sparked by an alert management and honestly interested personnel. At Waukesha Foundry, one of these men is Clyde Zamjahn, the safety director.

In 1948, the foundry's management was confronted with a serious safety problem. Their lost-time accident rate had reached 22.1 and they decided it was time to start a downward trend. That's where Zamjahn came into the picture. He was given the job of setting up a plan that would make a real dent in the accident picture at the plant. A former teacher, he attacked the problem in the methodical, unexcited, and thorough way of his profession. It wasn't possible, he reasoned, to eliminate accidents if you didn't know what was causing them. So, with accident prevention specialists, a careful study of past accidents was begun to determine what kinds of controls were most urgently needed.

Out of this study came three immediate recommendations and another group of plans which became the basis for a long-range program designed to induce safer work habits on the part of the plant's employees. Safety goggles eliminated many of the eye hazards that existed in the chipping and grinding department; safety shoes provided needed protection from heavy falling objects; other items of safety apparel—coats, aprons, face shields, spats, pants, and gloves also sharply reduced the exposure to injury that had been present in handling materials. But lasting accident prevention requires more than mere devices. Management and supervisors set about to make safety a basic part of Waukesha Foundry's entire production operation.

As the basis for this long-range effort, the foundry inaugurated a series of regular accident preven-

Shoes, leggings, gloves, jackets, and goggles are standard equipment.



tion meetings. These are still held each month and representatives from each of the company's departments attend the meetings which are designed to consider new hazards as they become apparent and to seek ways of correcting them. Almost all of the positive steps that have been taken in the past six years to promote better working conditions have originated in these planing sessions.

Well aware of the human desire for recognition and of the natural competitive instincts in most of us, management has put the various departments in competition with one another. Bulletin boards which list the number of successive accident-free days it has achieved are prominently displayed in each department. Rewards are given to those which compile the most impressive records.

The employees are interested! Take a trip through the plant; stop and talk with any of the 350 workers about his job; what he's doing, how he likes the work—the usual questions. It won't be long until he begins to talk safety. Most likely he will be able to say that he's never suffered a lost-time injury and he'll boast about the safe record his department has achieved.

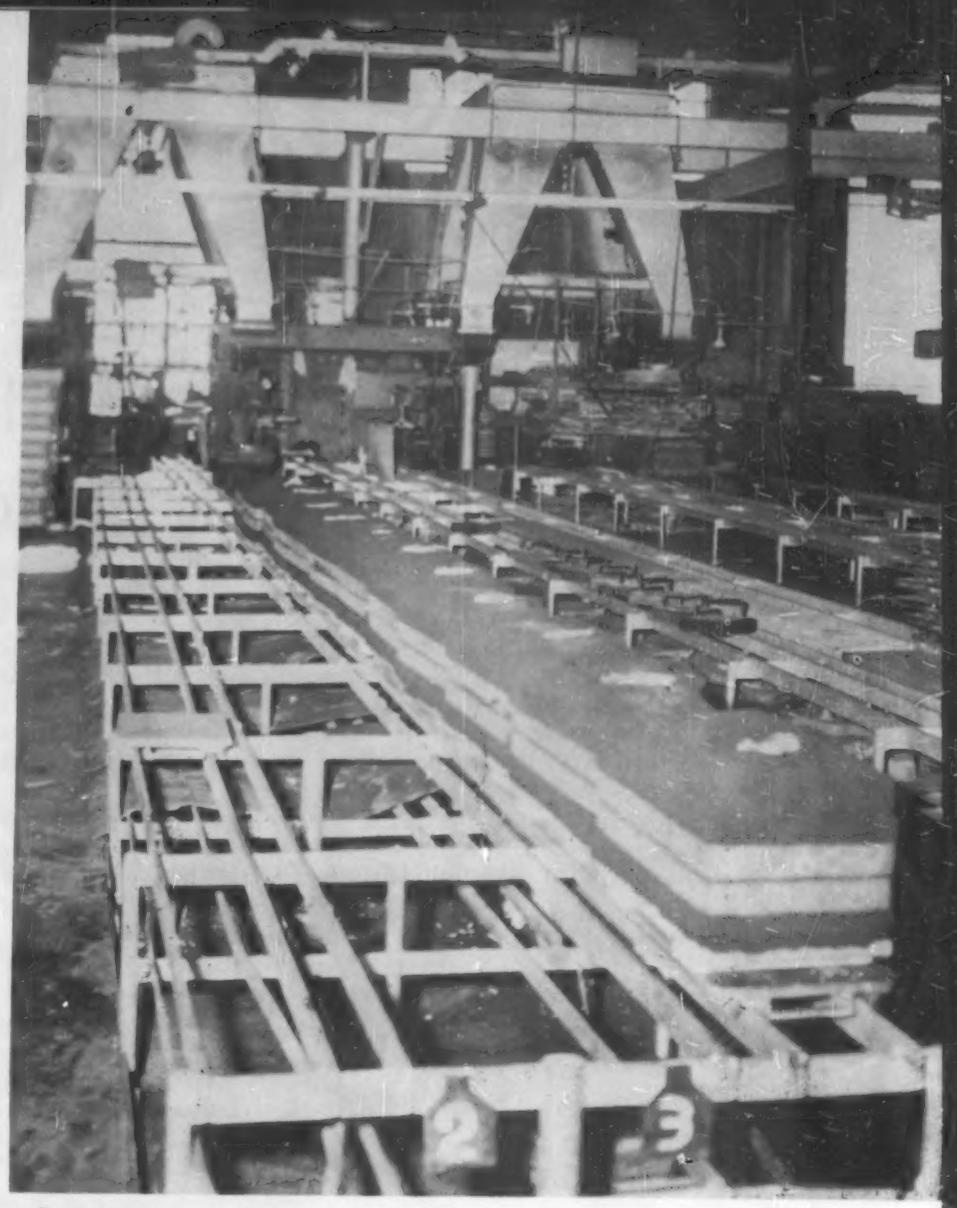
On your tour you will also notice the liberal use of bulletin boards (aside from those which chart each department's safety record) and the pointed safety messages they bear. They are spotted at strategic points throughout the buildings so that almost every time a worker raises his eyes to look around one of them is in clear view. The foundry's safety director changes these boards at least once a week with materials he gathers from many sources. "You've got to keep changing them to keep the fellows reading them," he explains.

Another sure way to reduce plant injuries is to reduce the chance of human failure as much as possible. At Waukesha Foundry, every effort is being made to achieve mechanization. In any foundry, one of the prime dangers is injuries resulting from handling materials. Installation of chain and electric hoists, conveyors, automatic shakeout operations, overhead sand conveyors, cleaning machines, a sand conditioning and reclamation plant, and a liberal use of plant trucks has removed a large percentage of the exposures to injury.

Industrial noise is now receiving top priority treatment from safety experts in plants and factories throughout the country. Waukesha Foundry is in the forefront of industry in its area in noise reduction. It is approaching the problem with methodical carefulness.

When Employers Mutuals asked industry in the Waukesha area to set up a community pre-employment hearing-measurement program Waukesha Foundry was among the first to sign up. The company has since played a vital role in establishing the program and making it work. A central examining station is maintained by Waukesha's industrial firms. All new employees of cooperating plants are sent there for accurate hearing measurements as a part of their pre-employment physical examination. The purpose is to keep noise-sensitive workers away from unusually noisy jobs.

The company is now turning attention to its own plant. With the help of insurance company engineers, it has just concluded a series of noise-level tests and surveys in the foundry to determine which areas of operation are the most critical from a noise standpoint. When this is finished, recommendations of what to do about the noise will be made. Waukesha Foundry has met and licked tough safety problems in the plant before. In time, they'll lick this one, too.

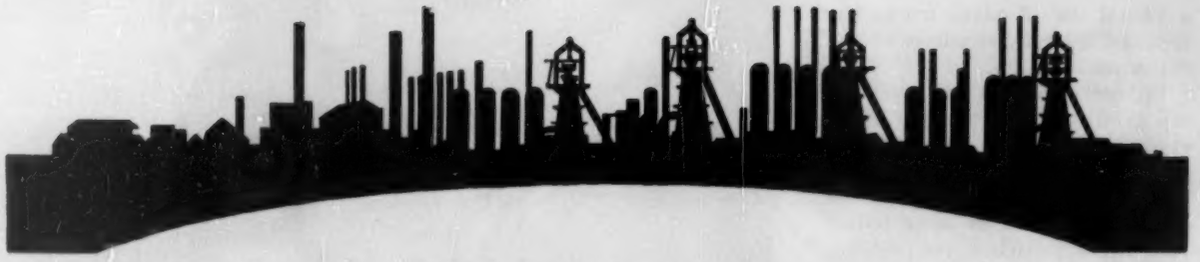


Conveyor systems eliminate much handling, make for worker convenience.

"You've got to change them to keep interest."

NOTICE
WE WANT TO PROVIDE A SAFE PLACE FOR EVERYONE EMPLOYED IN THIS PLANT
REPORT ANY DANGEROUS CONDITIONS TO YOUR FOREMAN
EVERY ACCIDENT NO MATTER HOW SMALL MUST BE REPORTED TO YOUR FOREMAN AT ONCE
DON'T TAKE CHANCES — SAFETY FIRST
DAYS
WITHOUT
A LOST TIME
ACCIDENT

Competition resulted in most impressive records.



Woodward Promotes Sales of Foundry Products by National Advertising

Woodward Iron Company believes that what helps its customers, helps Woodward.

That is why it has conducted for the past two years a national advertising campaign, at its own expense, to promote the use of cast iron products of all kinds.

Many foundries have written our Company letters of appreciation and commendation for its effort to acquaint architects, contractors and home builders with the outstanding advantages of durable cast iron.

Woodward invites inquiries from foundries interested in uniform, quality merchant iron—foundry or malleable grades.

For quotations, write or call our Sales Department, Woodward, Ala.

Phone Bessemer, Ala. 5-2491

or Sales Agents for territory north of Ohio River: HICKMAN, WILLIAMS & COMPANY with Sales Branches at—

609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1639 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Building, Detroit 26, Mich.; P. O. Box 333, Duluth 1, Minn.; 412 Guaranty Building, Indianapolis 4, Ind.; 407 Foshay Tower, Minneapolis 2, Minn.; 70 Pine Street, New York 5, N. Y.; 1500 Walnut Street Building, Philadelphia 2, Pa.; 1910 Clark Building, Pittsburgh 22, Pa.; 796 Arcade Building, St. Louis 1, Mo.

Woodward Iron Company

WOODWARD, ALABAMA

Independent Since 1882

WOODWARD IRON COMPANY

Bondage

Oh, what possessed me that I wanted to be
A workman in anyone's dirty foundree?
In sloppy old denims—a cap on my bean,
I'm only a slave to a molding machine.

I put the sand in and they shake the sand out,
The hot metal pours from the ladle and spout.
I squeeze 'em and bump 'em, I ram and I peen. . .
The life of a slave to a molding machine.

A molder's biography hectic and sad;
Long hours, hard toil—but the pay ain't so bad.
Though he ruins his feet with his hard safety shoes,
He's able to pay for his brew and his snoose.

Now all you young fellows, please take my advice;
Before you start into a foundry, think twice.
No one to advise me, I started out green,
And became a slave to a molding machine.

So take the sworn word of one who is older,
Be a chipper, a grinder, but never a molder.
I made that mistake and learned for my pains
That a molder's a coremaker—minus the brains.

I look to the future, there's nothing ahead,
And someone will run my machine when I'm dead.
With sand in my whiskers and holes in my clothes,
Why I keep on working the Lord only knows.

Bill Walkins, the foundry bard, author of the poems published in *Rammed Up ad Poured* which are being republished in MODERN CASTINGS has been named editor of the Electric Steel Foundry Co., Portland, Ore. Prefers his old title of sand mill operator, he says, but is going along with the change.

CASE STUDY REPORT
On 3 Small Gray Iron Shops

Department of Labor analysis prepared for foreign foundrymen has great interest for U.S. operators

WHAT THIS STUDY IS ALL ABOUT

■ This report is condensed from a study of five small gray iron foundries by the U.S. Department of Labor. It was undertaken to present the facts about typical efficient small foundries in the United States to persons in nonindustrialized or semi-industrialized countries.

The editors of MODERN CASTINGS have prepared this special section from the original 191-page report. They decided to elimnate from the study two foundries employing 151 and 24 persons respectively and to confine it to three foundries of almost identical employment volume. Foundry A has 53 employees, Foundry B has 47, and Foundry C has 53.

Comparisons between the plants, productivity and methods of operation, therefore, should have tremendous interest for all gray iron foundrymen. Nearly half of all gray iron foundries in the United States fall within the 20- to 100-employee range. About a fourth are larger and slightly more than a fourth are smaller. Thus the size of foundries chosen, averaging about 50 employees each, is very close to the median gray iron foundry in the U. S.

The study describes only what is actually going on in these three plants and the way in which each has solved its special problems. It is not intended to be a manual of recommended practices.

FOUNDRY A

- **Small foundry employs 53 persons**
- **Specializes in castings for construction**
- **Most materials handled manually**
- **Here's how the foundry operates**

■ Foundry A operates on a contract basis and manufactures only gray iron castings. It is located in a small town near a large metropolitan industrial area and employs 53 persons. It is unusual in maintaining its own patternmaking department.

The foundry's castings are made solely for the construction industry and consist chiefly of manhole covers, frames and trap doors, drainage grates and frames, downspout shoes and to a lesser extent brackets and legs for permanent stadium seats and benches and wheel guards for garage door frames.

All castings are made to order for particular construction needs and are ready for installation when they leave the foundry, requiring no further finishing or machining.

During the five-day 40-hour week reported here the foundry made individual castings ranging from 1½ to 475 lb in weight. Most were in the 25- to 300-lb range. The foundry melted 120,055 lb of metal and produced 102,307 lb of nondefective castings for an average daily yield of 85.22 per cent. On an annual basis about 8 per cent of finished castings are found to be defective.

■ **Foundry buildings** consist of a main brick structure with high wood ceilings and a tin roof in which all processing takes place, and an adjoining pattern storage building on one side of the main structure. Raw materials storage areas are on the opposite side of the main building. The buildings were built in 1920 and acquired by the present operators in 1944. The foundry layout is illustrated on page 43.

■ **Machinery and equipment.** There had been little change in the five years previous to the study which was made between November 16 and 20, 1953—the one improvement being installation of a company-built vertical skip hoist for charging the single cupola.

Coremaking is done by hand. There are three core ovens—two coke-fired and built into the building and one oil-fired.

Molding is by means of floor molding and machines. There are two jolt-rollover machines, one squeezer, and one slinger machine. The clean and ship department has an airless blast tumbler and there are portable pneumatic chippers and grinders.

Between departments, materials handling is by wheelbarrow or hand truck except for a single gasoline-powered industrial truck used to convey rough castings about 75 feet from the mold room to the clean and ship department.

In the core department a wheelbarrow is used to bring in core sand. Steel core trucks are used to service the core ovens.

In the molding department, two large pouring ladles are suspended from an overhead monorail crane

traveling the length of the mold room. Five overhead electric hoists in the mold room are used to lift large castings.

The clean and ship room has an overhead electric hoist to lift castings within the department as well as to lift finished castings into motortrucks for delivery to customers.

■ **Employment and staffing.** During the period reported, the plant employed 53 persons, including 45 production and related workers and eight administrative and office employees. Of the 45 production and related workers, 22 were classified as direct and 23 as indirect workers. Indirect workers are those whose efforts are related to more than one casting or class of casting.

The only nonworking supervisor in the foundry is the plant superintendent who is classified as an administrative employee. There are three working foremen. One in the coremaking department works as a journeyman coremaker. The foreman in the molding department is a journeyman molder. The third working foreman heads the shakeout crew which does most of its work after the rest of the foundry has stopped for the day.

The foundry's staffing pattern and man-hours by department are shown at right above.

■ **Melting department.** Pig iron, commercial scrap iron, coke and limestone, all used in the melting operation, are delivered by motor truck and dumped in piles in an open storage area immediately outside the cupola room. Foundry scrap iron is moved on wheelbarrows.

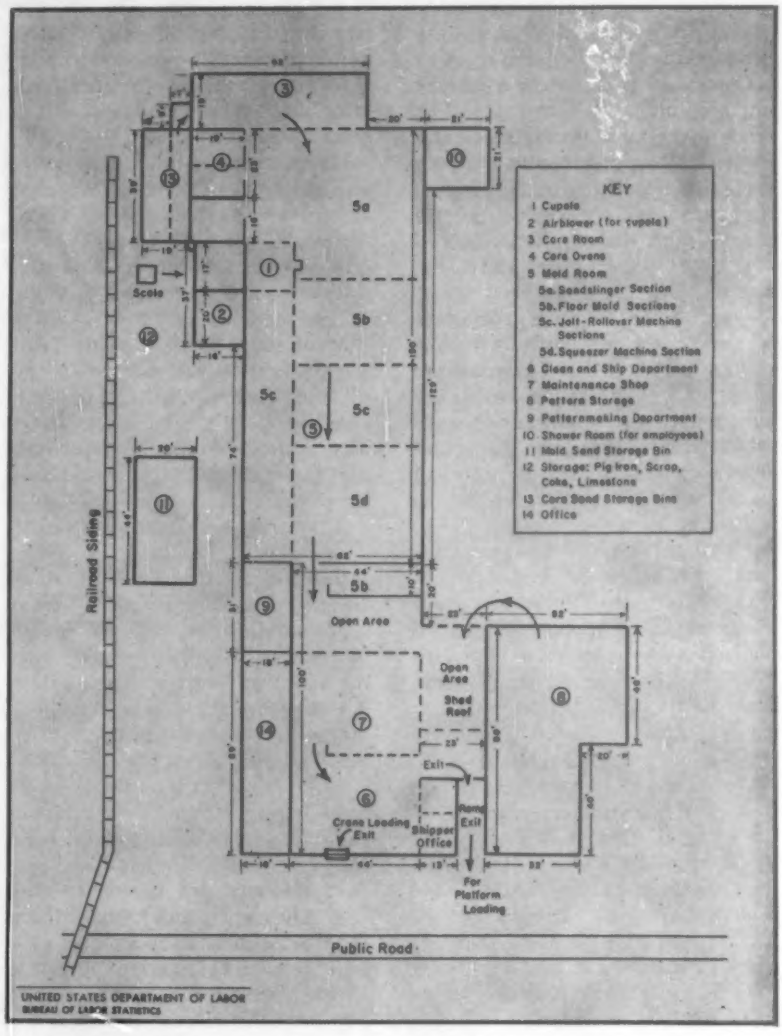
The cupola tender makes the necessary cupola repairs, pointing up loose firebrick with a fire clay mortar. With the same mortar he relines and repairs the cupola spout and the pouring ladles. Using a wheelbarrow the cupola laborer weighs and dumps sufficient coke into the skip hoist to make up the cupola coke bed. The laborer then weighs the amounts of pig iron, scrap iron, coke and limestone required to make a single charge and feeds it into the skip hoist by wheelbarrow.

He adds charges until the cupola is filled to the charging door. Early in the afternoon the cupola tender lights the coke bed at the bottom

Department	Number of production and related workers	Man-hours worked		
		Total	Direct	Indirect
Melting	2	80.0	40.0	40.0
Core	5	200.0	120.0	80.0
Molding	19	752.0	472.0	280.0
Clean and ship	8	320.0	240.0	80.0
Service departments:				
Patternmaking	2	80.0		80.0
Maintenance	2	80.0		80.0
Pattern storage	1	40.0		40.0
General foundry labor	4	160.0		160.0
Custodial	2	91.0		91.0
Total	45	1803.0	872.0	931.0

of the cupola through the cupola spout. As the iron melts and is drawn off the cupola laborer adds charges until the production needs of the day are met.

A typical charge consists of 225 lb of pig iron, 1275 lb of foundry and commercial scrap iron, 30 lb of limestone, and 150 lb of coke for a total weight of 1680 lb. The cupola coke bed contains 1900 lb of coke. There are an average of 16 charges per day and an average daily melt of 12 short tons. During



Layout of Foundry A . . Production flows in a relatively direct line.

the five day period discussed here 120,055 lb of metal were melted.

Metal pouring begins at 2:30 pm each workday. The cupola tender taps the metal into one of two pouring ladles suspended from an overhead monorail crane in the mold room. After the bottom has been dropped the solidified metal residue is collected and deposited on the foundry scrap pile the next morning by the cupola laborer who also carts off the slag.

The cupola tender and laborer each work 40 hours per week. Together they have a production rate of 0.78 hr per 1000 lb of good castings, on the basis that the 120,055 lb of metal melted during the week produced 102,307 lb of good castings.

■ **Core department.** Each morning the core department receives a "daily order for cores" from the production scheduling clerk.

Core sand is stored in a storage bin adjoining the core room. The sand mixer man brings core sand from the storage bin into the core room by wheelbarrow. He shovels the sand into one or two rotary mixers, adds the required core oils and core binders, and starts the mixer.

Once mixed he places it into the wheelbarrow and hauls it to the coremakers' benches. The cores are prepared by hand, then loaded onto steel trucks mounted on rails which carry them into the coke-fired core ovens. The sides of these ovens are lined with racks to take additional cores if necessary. The oil-fired tray-type oven is used for smaller cores.

The cores are left in the ovens overnight and withdrawn in the morning by foundry laborers, placed on hand trucks, and distributed to the appropriate mold sections.

Five men work in the core department and have a production record of 1.95 man-hours per 1000 lb of good castings.

■ **Molding department.** The plant production clerk supplies the mold department with a copy of the daily production schedule at the start of each work day.

The cores and patterns to be used that day are distributed to the appropriate mold section by foundry laborers and the pattern storage man, using hand truck and wheelbarrow respectively.

Laborers wheel sand into the mold department on wheelbarrows and add it to the sand left at various floors the night before by the shakeout crew. From 16 to 18 tons of molding sand are used per month. It is New Jersey silica sand with a moisture content of 4 to 6 per cent and an AFS grain fineness number of 60.

Both loose piece and match plate patterns are used in the molding department. When loose patterns are used, standard or temporary runners are employed and the molder does the required gating by hand.

The foundry stores about 25,000 patterns, and the average number of different patterns used is 300. Wood patterns comprise 75 per cent of the total; metal (aluminum) patterns 25 per cent. Of the types of patterns, loose piece comprise about 80 per cent and match plate 20 per cent.

Hand rammers and/or portable pneumatic sand rammers are used to butt off machine molds. There are two floor molding sections, two jolt-rollover machine sections, one squeezer machine section, and one slinger section.

Molders continue working until shortly before 2:30 pm when the shakeout crew is scheduled to begin pouring. The melted metal is released from the cupola spout into the ladles which are pushed by hand along the path of the monorail running the length of the mold floor.

Pouring is directly from these ladles for larger castings but from small hand-carried ladles for smaller castings. The pouring continues for about an hour with the shakeout crew doing the pouring under the general supervision of the various section molders.

After all the foundry workers have left the foundry at 3:30 pm the shakeout men remain to shake the castings from the sand and prepare the sand for reuse the next day. They open mold flasks where required and lift the smaller castings manually. Larger castings are lifted with the aid of one of the five overhead electric hoists. If the casting is cored it is pulled over to one side and the core is knocked out. Molding sand which is reused thus is kept free of the core sand which is not reused.

A sand cutting machine conditions the molding sand.

Castings are piled in one location in the mold room from which they are transferred to the clean and ship department by a gasoline-powered industrial truck.

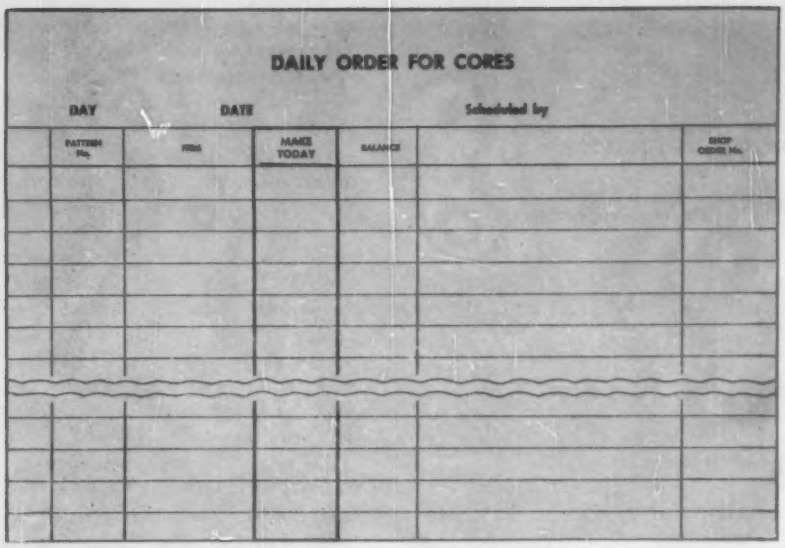
Nineteen men work in the molding department and average 7.35 man hours per 1000 lb of good castings—4.61 man hours direct and 2.74 man hours indirect.

■ **Clean and ship department.** Shakeout men from the molding department transport most of the castings during their evening shift to provide an adequate workload in the clean and ship room at the start of the day. Foundry laborers move the remainder of the castings during the day.

The rough castings are deposited near the table-type airless blast cleaner which uses steel shot. The operator loads each casting on the table of the machine by hand or overhead electric hoist, depending on the weight of the casting. When the table has been covered with castings he closes the door and starts the machine by pushing a button. About three minutes are required to clean each load. The operator then opens the door and determines whether the castings are sufficiently clean. If additional cleaning is required he turns the castings over on the table and repeats the cleaning operation. A dust collection unit is connected to the machine.

After they are cleaned, the castings are removed from the table by the operator. Where necessary they are turned over to workers who use pneumatic chippers and grinders to remove superfluous iron such as gates, risers and flash.

An "assembler" in the clean and ship department matches up castings which are parts of a set, such as a manhole cover and the manhole frame in which it is to fit. If metal must be removed to make the parts fit together, the assembler will do the necessary machining. Machining is required infrequently and does not demand close tolerances. Generally the assembler uses hand tools and, when necessary, a drill press and a small boring mill.



Daily Order for Cores schedules coremaking for the day before cores are needed in the molding department. Pattern storage gets a copy.

Castings are shipped loose but tagged by the shipper to indicate the identity of the sender and the receiver. Large castings leave the department via overhead hoist through a door at the front of the building. Motor trucks back up to the door and the hoist lowers the castings into the trucks. Smaller castings leave the department on hand trucks through a side exit leading onto a loading platform from which motor trucks are loaded. The distance from cleaning and shipping room to the platform is about 40 feet. Loading onto motor trucks is by general foundry laborers or by men working in the cleaning room.

Eight men work in the clean and ship department and have total man hours of 3.13 per 1000 pounds of good castings. Of this, 2.35 man hours is direct and 0.78 man hours is indirect.

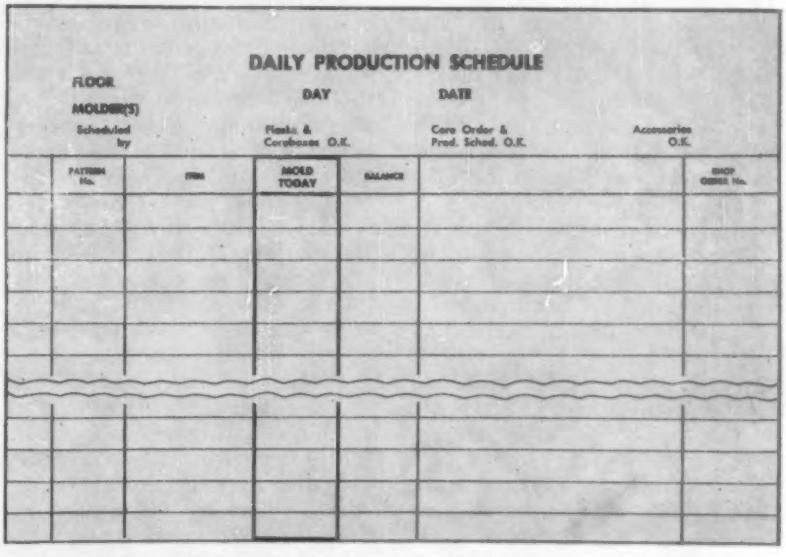
■ **Production control and scheduling.** When an order for a casting is received by the company, the office prepares three copies. A file folder is then prepared for the order. The master copy is placed in the folder, which is filed in the office. The second copy is sent to the production clerk in the foundry who schedules the order. The third copy goes to the shipper.

The production clerk keeps a chronological record of all orders. Production scheduling is on a day-to-day basis. When an order is ready for production, as determined by the shipping date, the production clerk starts to schedule the order. He determines, first, if the casting is to be cored. If so, he prepares a "daily order for cores" in triplicate one day before scheduling production in the molding department.

One copy of the core order remains with the clerk, a second copy goes to the core room, and the third copy goes to the pattern storage department. This enables the pattern storage man to deliver the appropriate core boxes to the core department so that it can make the required cores and have them ready for use by the mold department the next day. The production clerk also determines the number of castings to be made the next day, depending on the available patterns, flask equipment, and whether the casting is to be made by floor molding or by the foundry's machine molding department.

The production clerk then makes up the daily production schedule in quadruplicate on the day when production is scheduled for the molding department—which is the day after the cores are ordered. A copy of the schedule is retained by the production clerk, a second copy goes to the shipper, a third goes to the appropriate mold section in the molding department, and the fourth copy goes to the pattern storage man so that he knows which patterns to deliver to the molding room that day. The shipper matches the copy of the daily production schedule with this copy of the original order. He then knows which order is coming through for delivery and he so informs the front office which makes the appropriate entries on its records.

For other operational methods of Foundry A, see page 52, where they are compared with those of Foundries B and C.



Daily Production Schedule is made in triplicate and sent to shipping room, pattern storage, and mold section to help them plan work.

FOUNDRY B

- **Employment is 47 workers in this foundry**
- **It specializes in castings for textile machinery**
- **Average yield is 71.5% defects only 2.5%**
- **Many manual operations in this foundry**
- **Machine molding at a minimum**

■ Foundry B is a small independent plant operating on a contract basis and located in a large industrial city. It employs 47 workers.

The foundry's castings are made chiefly for the textile machinery industry, which accounts for approximately 75 per cent of the output. The remaining 25 per cent of the plant's production is for general industrial machinery and for various jobbing machine shop needs.

Castings range from a few ounces to 3000 pounds, but most are under 25 pounds.

Individual castings made during the reported period—a five-day, 40-hour week, between February 22 and 26, 1954—ranged in weight from ⅓ lb to 433 lb but were predominantly under 25 lb. The foundry melted 70,000 lb of metal and produced 50,025 lb of nondefective castings, for an average yield of 71.5 per cent.

On an annual basis, approximately 2½ per cent of the total poundage of finished castings is found to be defective. Defects are due, mainly, to blow-holes in the castings and the pouring of "dead" iron—iron that has lost fluidity as a result of being held in the pouring ladle too long. The foundry is proud of its record for producing nondefective castings.

■ **The foundry building** was constructed many years ago and consists of a one-story brick structure with a vented roof typical of other foundries in this report. It covers an area of approximately 4450 sq ft. At one corner of the building there is a second and third floor wood addition to the brick structure. The second floor is used for the office and the third floor houses the foundry washrooms. The second and third floor rooms each have an area of approximately 225 sq ft. There are no other plant structures.

All of the processing departments, with the exception of the melting department, are located within the foundry building. The cupola is on the outside of the building with its spout entering a hole in the building wall of the molding department.

The patterns and core boxes, which are supplied by the customers, come in with an order and leave with the finished castings. Consequently, there is little need for pattern storage space. Temporary storage of patterns and core boxes is provided at one end of the molding department. Finished castings are shipped as they are completed, so that little finished goods storage area is required.

■ **Machinery and equipment.** There has been little change in the machinery and equipment in the foundry over a period of years. The cupola is serviced by an open-shaft elevator in which the cupola charger lifts the raw material for the melt from the ground level to the cupola charging door.

All coremaking is done by hand. There is one company-built, coke-fired core oven in the department. Core sand mixing is done by using a paddle-type sand-mixing machine. Molding is done by means of floor, bench, and machine methods. The molding machines are simple squeezer-type machines. Although the foundry has five of these squeezer machines, it had been using only one during, and for a considerable time prior to, the reported period. Molding sand is mixed manually. Facing sand, used by the floor molders, is mixed by a sand muller.

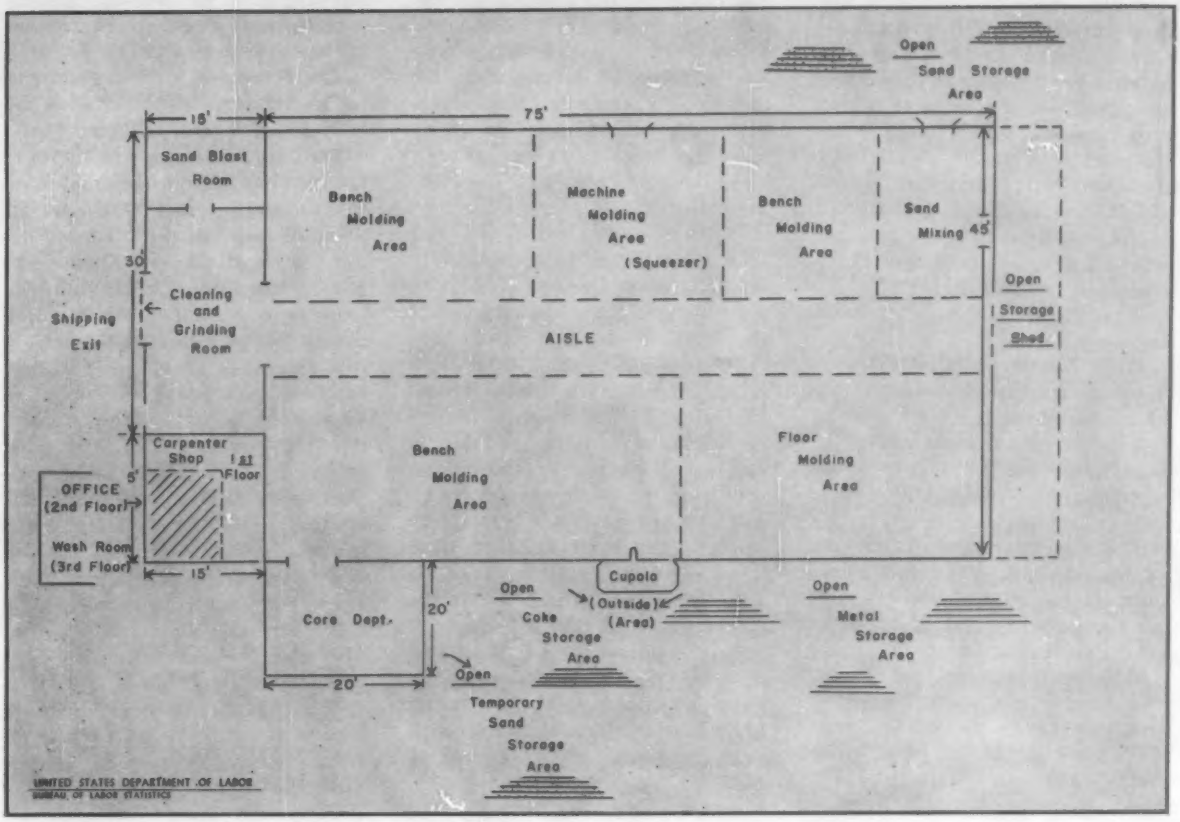
The clean and ship department uses two tumblers and one manually-operated pneumatic sand blast in its cleaning operations. Portable pneumatic chippers and grinders, as well as a stationary grinder, are also used in the clean and ship department.

All materials movement in the foundry is by means of wheelbarrow and/or hand truck, with the exception of a 3-ton overhead crane in the molding department and the elevator serving the cupola.

■ **Raw materials** used in the melting department are pig iron, steel rail, commercial and foundry scrap iron, coke and limestone. The steel rail represents 5 per cent of the total metal used in a single charge. As the cupola used does not have a slag disposal outlet, a deep well zone is maintained so that the slag may be dropped out of the bottom of the cupola at the end of the day. All raw materials used in the melt are delivered by motor truck. Core sand and molding sand, used by the core department and the molding department respectively, are also delivered by motor truck.

■ **Employment and staffing patterns.** During the reported period the foundry employed a total of 47 workers, including 43 production and related workers, and four administrative and office employees. Of the production and related workers, 20 were classified as direct and 23 as indirect. The four administrative and office people included the company president, who is active in the daily operations of the foundry; the production manager, who also takes care of the patterns; and two office girls who perform clerical duties.

The general supervision of the foundry is the responsibility of the company president and the production manager, both of whom are classified as administrative personnel. The only other supervision is done by three working foremen. One of these men is in the core department, another is in the mold-



All processing departments are within the building except the cupola, and its spout enters from outside.

ing department, and the third is the shipper, who supervises the clean and ship department.

The foundry's staffing pattern and man-hours by department for the reported period, are shown below:

Department	Total number of production and related workers	Man-hours worked		
		Total	Direct	Indirect
Melting	3	123.00	40.00	83.00
Core	5	196.50	156.50	40.00
Molding	18	712.00	592.00	120.00
Clean and ship 1/	6	216.25		216.25
Foundry service group (nondepartmental)	11	435.50		435.50
Total	43	1683.25	788.50	894.75

1/ Company classified the clean and ship department as an indirect function.

Castings are produced by four processing departments—melting, core, molding, and clean and ship. These departments are serviced by a nondepartmental group.

■ **Melting department.** The raw materials for the melting operation are delivered by motor truck and dumped in an open storage area immediately adjoining the cupola.

While the cupola tender is making his daily cupola repairs, the cupola charger, assisted by a cupola laborer, weighs appropriate amounts of pig iron, scrap iron, steel rail, coke, and limestone. When the cupola tender finishes his repairs he notifies the cupola charger, who then begins charging the cupola. Assisted by the cupola laborer, the cupola charger manually loads a wheelbarrow which is wheeled onto an open-shaft elevator that services the cupola. The cupola charger rides on the elevator to the charging door of the cupola and dumps the materials into the cupola. He repeats this procedure until the day's production needs are met.

A typical charge consists of 450 lb of pig iron, 500 lb of commercial and foundry scrap iron, 50 lb of steel rail; 120 lb of coke, and 25 lb of limestone for a total weight of 1145 lb. There are 14 such charges per day. The cupola coke bed contains 500 lb of coke. An average of seven short tons of metal is melted per day.

The cupola tender ignites the coke bed in the cupola about one-half hour before pouring begins. At 2:30 pm daily the cupola tender begins to tap the melted metal into a large ladle suspended from an overhead crane in the molding department.

Man-hour requirements in the melting department total 2.46 per 1000 lb of good castings—0.80 direct and 1.66 indirect.

■ **Core department.** Every morning, at the direction of the production manager, a general laborer using a wheelbarrow brings the core boxes for the day's production to the core department. Each core box is chalk-marked with the number of cores to be made; no production or scheduling forms accompany the core boxes.

Core sand is mixed in a paddle-type mixing machine, then taken to the coremakers' work areas. A

working foreman-coremaker and three coremakers, all of whom are journeymen, make all the cores by hand. After the cores are made they are placed on the racks of a steel core-truck which is on tracks. When the truck is filled, it is pushed into the coke-fired foundry core-oven. The following morning the truck is removed from the oven and general laborers place the cores on wheelbarrows and deliver them, as directed, to the appropriate molding room areas.

Core binders used are wheat flour and corn flour. About 20 tons of core sand are used per month.

The core department works 3.93 man hours per 1000 lb. of good castings produced—3.13 direct and 0.80 indirect.

■ **Melting department.** At the start of the work day, the production manager has general laborers place all the patterns and flasks to be used that day at one point in the molding department. The number of castings to be made from each pattern have previously been chalk-marked on the patterns by the production manager. The molding room working foreman has laborers distribute the patterns, cores, and flasks to assigned molders.

Laborers replenish the molding sand in the molding department by adding sand brought in from the outside storage area to the previously used sand which has been cut for reuse. Molding sand is mixed by hand. The laborers also prepare facing sand, mixing it by machine.

Molding is done by floor, hand, and machine molders. During the reported period, and for some time previously, there was only one machine molder and he used a simple squeezer molding machine. Floor molders use portable pneumatic rammers to pack the sand. The hand molders and the machine molder use hand rammers. Both loose piece and match plate patterns are used and, consequently, standard and fixed runners are employed.

Each molder is responsible for pouring the molten metal into his own molds. The melted metal is released from the cupola spout into a large ladle suspended from a 3-ton overhead crane. This crane, which is controlled by the molders from the floor level, is the only mechanical lifting device in the foundry.

For large castings, pouring is directly from the large ladle; for the smaller castings, which predominate, melted metal is drawn from the large ladle into smaller hand ladles. Pour continues for approximately 1½ hours.

One-half hour before the day shift leaves, the night (shakeout) laborers come to work. They do some general cleaning and, when the castings have cooled, they shake out the castings from their molds. Shakeout is entirely by hand except for the larger castings where the overhead crane is used for assistance. The night laborers recondition the molding sand for reuse, employing a hand-held screen to sieve the used molding sand. They carry the rough castings, via wheelbarrow or hand truck, to the clean and ship department.

The molding department uses about 50 tons of Albany or similar natural molding sands per month and about 10 tons of facing sands with bentonite and sea coal as binders.

Patterns are supplied by customers and about 95 percent are wood. About 600 different patterns are used per month. Loose piece patterns comprise 80 percent of the patterns used and match plate patterns comprise 20 percent.

About 10 percent of the molds are made by machine, 50 percent are bench molds made by hand, and forty percent are floor molds.

The molding department works 14.23 man hours per 1000 lb of good castings. Of these, 11.83 man hours are direct labor and 2.40 indirect.

■ **Clean and ship department.** The night laborers from the molding department move the rough castings to the clean and ship department. They will, in some instances, place smaller castings directly into either one of the two tumblers in the clean and ship department. Larger castings are cleaned by sand blasting with an air-sand hose. The chippers, using either pneumatic chipping tools or hand rammers, chip off the burrs and other rough extensions from the castings. To finish cleaning the castings, the grinders use either a stationary grinder or pneumatic grinding tools. No other machining is performed. The castings are now ready for shipment.

The clean and ship department works 4.32 man hours per 1000 lb. of good castings.

■ **Foundry department.** This foundry has a group of employees who are not assigned to any specific processing department but service the entire foundry. These employees are classified as indirect workers and their job titles and duties are as follows:

A carpenter, whose main task is to make and repair the wooden flasks used in the molding department; also does any carpentry work in the foundry. He uses the conventional woodworking tools, including a circular saw and a band saw.

A general maintenance man keeps the foundry equipment and machinery in good working order. He also performs electrical and general foundry repairs.

Six general foundry laborers who were employed during the reported period perform the unskilled labor tasks in the foundry's departments. They move material, haul and mix sand, and work where assigned.

Two watchmen guard the foundry premises. One is primarily a relief man for the full-time watchman. They also do some foundry cleaning-up while performing their regular chores.

The one remaining employee in the nondepartmental service group is the truck driver-handyman. This employee picks up some of the customer's patterns and core boxes, brings them to the foundry, and returns them to the customers with the finished castings. He also does odd jobs in the foundry when he is not driving the truck.

Their man hours total 8.70 per 1000 lb. of good castings.

Foundry B is the only castings plant among the group studied which has developed this specific type of service department in its setup. It should be understood in making comparisons with the other foundries.

For other operational methods of Foundry B see page 52, where they are compared with those of Foundries A and C.

FOUNDRY C

- Foundry in rural area employs 53
- Castings are used in industrial machines
- Daily yield is about 70.3%
- Defects average about 5% annually
- Most equipment is relatively new

■ In 1928 Foundry C started in business as a brass foundry. It was located in a large industrial city approximately 20 miles from its present rural location. In 1945 it acquired a gray iron foundry which was also in the same city but at a different location. In 1950 the company moved to its present site so that both of its foundries could be at the same location, although they continued to be maintained as distinct units.

This report is concerned only with the operation of the gray iron foundry which employs 53 people.

All production is on a contract basis. The foundry's castings are made to order and are used for machine parts by manufacturers of industrial machinery of all types. Individual castings made during the selected reporting period—a five-day, 40-hour week, between February 22 and 26, 1954—ranged in weight from 27 lb to 2650 lb for floor-made castings and from 0.67 lb for machine- and/or bench-made castings.

During the reported period, the foundry melted 64,000 lb of metal and produced 45,016 lb of nondefective castings, for an average daily yield of 70.3 per cent. The floor-made castings accounted for 34,314 lb of the total good castings and the machine- and bench-made castings made up the remainder of 10,702 lb.

On an annual basis, approximately 5 per cent of the total poundage of finished castings is defective. Defects arise mainly from blowholes in the castings, poor pouring, pouring metal that has grown cold in the ladle, and core shifts.

■ **Foundry buildings.** The gray iron foundry is housed in a group of one-story concrete and cinder block buildings with vented roofs. These buildings are so interconnected that the effect is that of one large building with linking passageways. The buildings were all constructed in 1950 and are surrounded by rural farm land. The largest of the buildings is used for all the processing operations.

Linked to this building by an areaway used as a flask repair shop are the pattern storage areas, the core box storage area, a pattern repair shop and a washroom. The office is in a small building a short distance from the foundry buildings. There are two sand storage sheds, one for the molding sand and the other for core sand. These are located at convenient points near the processing building. Raw materials are stored in a large open area to one side of the main foundry building. The foundry is serviced by a railroad siding.

■ **Departments.** The manufacturing process at this plant is the same as in the other foundries studied. All of the processing departments are set up so that the work flow is to and from the molding department in an orderly and direct line. The melting department's cupola spout opens into the molding department.

Cores are made in a corner of the main foundry building which opens into the molding department. The molding department occupies the major portion of the main foundry floor from which rough castings are transferred to the clean and ship department.

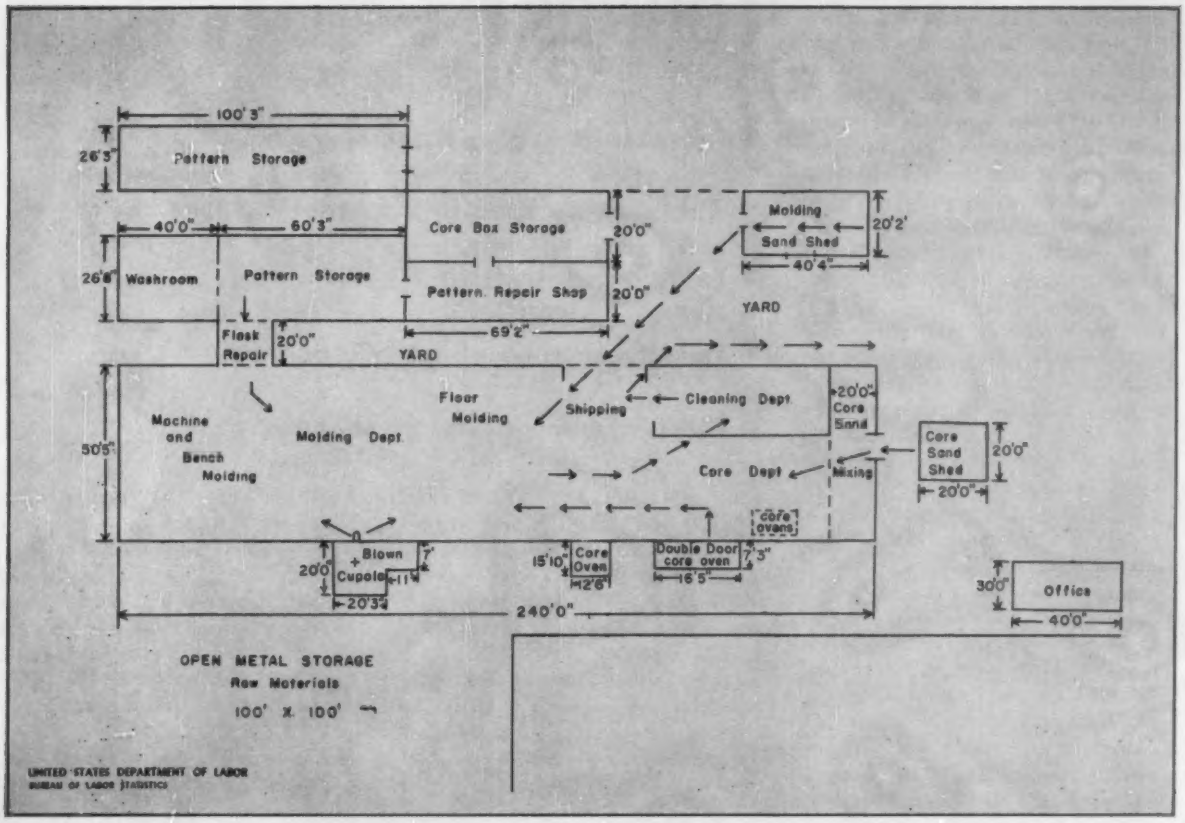
■ **Machinery and equipment** When the company moved its gray iron foundry to the present location in 1950 it also transferred the foundry equipment. Most of the equipment was relatively new as the company first began making gray iron castings in 1945. Other new equipment was also added.

■ **Employment and staffing.** During the reported period the foundry employed 53 people, including 48 production and related workers and five administrative and office employees. Of the 48 production and related workers, 26 were classified as direct and 22 as indirect workers.

The foundry superintendent is the only nonworking supervisor in the foundry; he is classified as an administrative employee. He directly supervises all the departments. The only other supervisor is a working foreman in the core department.

The foundry's staffing pattern and man-hours by department for the period under study are shown below:

Department	Total number of production and related workers	Man-hours worked		
		Total	Direct	Indirect
Melting	2	82.50	41.25	41.25
Core	8	313.00	273.00	40.00
Molding	20	798.00	472.00	325.00
Clean and ship	7	290.50	250.50	40.00
Service departments:				
Pattern and flask repair	2	87.50	———	87.50
Maintenance	2	90.50	———	90.50
Pattern storage	1	40.00	———	40.00
General foundry helpers	5	200.50	———	200.50
Janitorial	1	40.00	———	40.00
Total	48	1942.50	1036.75	905.75



As in other foundries, work at Foundry C flows in orderly and direct line to and from the molding department.

For the foundry as a whole, the direct unit-man-hours represented 53.4 per cent of the total unit-man-hours and the indirect unit-man-hours 46.6 per cent during the reported period.

■ **Melting department.** With the exception of an occasional delivery by motor truck, the raw materials used in the melting operation are delivered by railroad car. Pig iron, foundry and commercial scrap iron, coke, and limestone are all used in the melting operation.

The foundry cupola is located on the outside of the main foundry building in a combination brick and cinder-block structure adjoining the foundry building. The cupola spout opens into the molding department of the foundry through an opening in the building wall.

While the cupola tender makes his daily repairs to the cupola and ladle equipment, the cupola charger accumulates and weighs the raw materials for the charges. A company-built electrically operated vertical skip hoist carries raw materials in a bucket up to the charging door of the cupola and dumps them into the cupola. This is similar to the method of charging used at Plant A.

A cupola charger continues charging the cupola after pouring has begun until the day's needs are met. Quantities of raw materials used in a typical charge are 600 lb of pig iron, 400 lb of foundry scrap iron, 600 lb of commercial scrap iron, 40 lb of limestone, and 160 lb of coke for total charge of 1800 lb. In addition, the cupola coke bed contains 1500 lb of coke. There is an average of eight charges per day and 6.4 tons of metal melted.

Approximately one-half hour before pouring time the cupola tender starts the cupola fire. At about 2:30 pm daily the pouring begins. The melted metal is released into large ladles carried either by an overhead, floor-operated crane or by an electric industrial truck. Man hours per 1000 lb. of metal melted total 1.84, half direct and half indirect.

■ **Core department.** The core department is located in a corner of the foundry floor. After the pattern layout man has discussed the day's production schedule with the plant superintendent, the foundry helpers bring the appropriate core boxes to the core department. The foundry helpers, using wheelbarrows, then bring core sand into the core sand mixing area. The core sand mixer, operating a paddle-type sand mixing machine, prepares the core sand and delivers it, via wheelbarrow, to the work benches of the coremakers. All the cores are hand made by six journeymen coremakers and a working foreman-coremaker. Core washes are used where extra smooth surfaces are required on the inside of the castings.

After the cores are made, the coremakers place them on trays or racks which go into the core ovens. A large double-door, gas-fired oven is loaded with tiered racks with the aid of a lift truck. There is also a large single-door, gas-fired oven which has tracks inside so that a

steel core truck can be pushed into it. For the smallest cores, two smaller tray-type, gas-fired core ovens are used. Cores are removed from the ovens the following morning and the foundry helpers deliver them to the assigned molding department sections.

Commerical binders and core oils are used and about 35 tons of core sand are used per month.

Total departmental man hours per 1000 lb of good castings are 6.95, of which 6.06 are direct and 0.89 indirect.

■ **Molding department.** Each morning the pattern layout man orders the appropriate patterns and flasks delivered to the assigned molding sections, after discussing their distribution with the foundry superintendent. The patterns and flasks are delivered by general helpers. Molding sand is also brought into the molding department by the foundry helpers and conditioned by them for use in the molding process. The helpers manually mix the new sand and use mixing machines for conditioning sand previously used. Facing sand is prepared for use in a sand muller.

Molding is done by journeymen floor molders and molders who do both machine and/or hand molding, as required. Loose piece and matchplate patterns are used. Customers supply their own patterns except for about 5 per cent of the patterns which are purchased by the foundry to meet specific jobbing orders. Steel and wood flasks are used.

The foundry has 10 molding machines including two jolt-squeeze-rollover machines and eight squeezer machines; several of the latter jolt also. During the reported period, only four of the 10 machines were in use and these were used by molders who were also doing some hand molding.

Pouring the melted metal begins about 2:30 pm daily, or approximately 1-½ hours before the day shift ends. The molders are responsible for the metal poured in their own molds.

For the production of big floor moldings an overhead crane carries a large ladle from which metal is poured directly into the mold. For the bench and machine-made castings, as well as for some of the smaller floor castings, melted metal is transported in a large ladle, via an electric industrial truck. Molders draw off the metal into smaller hand ladles and then pour from these into the molds.

The night (shakeout) crew starts work at 3 pm and does some general cleaning in the foundry. When the metal in the molds is sufficiently cooled the crew manually shakes out the castings, using the overhead cranes or hoists where necessary to aid in lifting them. The nightmen also deliver the rough castings to the clean and ship department.

■ Albany No. 0 or No. 1 sands are used, with sea coal or bentonite added to facing sands. About 50 tons of molding sands are used per month.

75 per cent of the patterns are loose piece and 25 per cent are matchplate. About 70 per cent of molding is floor molding, 5 per cent is bench molding and 25 per cent machine molding.

The 20 employees in the molding department average 17.73 man hours per 1000 lb of good castings. Of this, 10.49 man hours are direct labor and 7.24 indirect.

■ **Clean and ship department.** One man in the clean and ship department is classified as a sandblast operator. He and the shakeout man are the only workers in the foundry on the night shift. He operates the two casting-cleaning machines in the department; a tumbling type and an airless blast type. The former is used for cleaning smaller castings. The other machine is used for the larger castings which are placed on the revolving table of the machine and cleaned by being blasted with steel shot while the table is rotating. Both machines have dust collection units.

In the morning, when the cleaning room men on the day shift come in, they further clean and finish the castings by chipping and grinding away any rough surfaces which remain. They use hand chipping and grinding tools, portable pneumatic chippers and grinders, and stationary grinders. To aid in lifting and moving heavier castings in the department, a hoist and a 2-ton overhead crane are operated from the floor.

The shipper's office is at one side of the cleaning and shipping department. After he tags the castings with the proper identifying information they are ready to leave the foundry for delivery to the customer.

The clean and ship department shows 6.45 man hours per 1000 lb. of good castings, of which 5.56 man hours are direct and 0.89 indirect.

■ **Production control and scheduling.** When an order for castings is received a record of the order is entered in a ledger know as the "customer's orders" book. A duplicate "shop ticket" is prepared in the office for each item on the order. These tickets are all numbered. The original order letter or form is sent to the production manager, together with duplicate sets of shop tickets.

The production manager files all orders received by him in chronological order. He schedules production on a day-to-day basis. When a particular order is ready for the foundry he sends one set of shop tickets to the pattern layout man and the other set to the shipper. The pattern layout man attaches each shop ticket to the appropriate pattern.

At the beginning of each day he confers with the foundry superintendent and tells him what is to be produced that day. The superintendent informs the pattern layout man as to which molder each pattern has been assigned for production. The cores are assigned by the core department's working foreman. Foundry helpers are directed by the pattern layout man in the distribution of the patterns and core boxes. At the end of the day the pattern layout man gives the production manager a record of the day's production.

When the finished castings reach the shipper, he checks each item on his set of shop tickets and returns the ticket to the office when the castings are shipped.

The skip-hoist used to charge the cupola and the cleaning machines used in the clean and ship department have resulted in a fairly high degree of mechanization of the two departments involved. The remaining equipment is similar to that found in the other foundries studied.

For other operational methods of Foundry C, see page 52.

OPERATIONS

- Only one foundry makes its own patterns
- None do metallurgical research
- Communications are informal
- Management of laborers varies
- All have some dust collectors

■The organizational patterns of foundries vary to a certain extent but almost entirely within a set framework. This framework is pretty largely determined by the nature of the metal casting process and the fixed activities required to do it properly.

Thus one foundry may have a patternmaking department and another may not but both must use patterns and the foundry which does not will have to buy its patterns outside (if it requires its own), whereas the foundry with such a department sets it up and treats it much as if it were an outside organization.

In general, not only the activities but the number of men required to carry them out in each of these foundries are surprisingly close to each other.

Patternmaking Department

Foundry A. Company maintains its own patternmaking department. When an order is received from a customer for a casting which has not been made previously by the foundry, the office prepares a pattern order which is sent to the patternmaking department, together with the customer's drawing and specifications. The transaction is treated as if the patterns were being purchased from an outside maker of patterns.

There are two men in this department—a journeyman wood patternmaker and his assistant. They make the wood patterns used in the molding department. When a metal pattern is requested the patternmaker makes up a wood master pattern which is sent to an aluminum castings maker to be used in making the metal pattern.

The patternmaker and his assistant also repair wood patterns when required. They use an assortment of hand tools and a bandsaw, circular saw, wood lathe and two wood planers.

Foundry B. No patternmaking department.

Foundry C. The foundry does not make patterns but has a pattern and flask repair department with two workers, a carpenter and his assistant who are mostly engaged in repairing wood patterns and flasks. They have a shop equipped with both hand and power tools including a power saw, bench-type wood lathe, and a jointer.

Maintenance Department

Foundry A. The department has a maintenance man and his helper who check foundry machinery and equipment and make necessary repairs. If new parts are needed they requisition them through the office. They keep the machinery oiled and make and repair the wood flasks used in the molding room. The foundry purchases its metal flasks. Equipment includes a bandsaw and a circular saw.

Foundry B. One maintenance man works under the general "foundry department."

Foundry C. There are two workers in this department—general maintenance men who attend to maintenance needs throughout the foundry, including machine repair when required. They worked a total of 90.50 hours during the period under study.

Pattern Storage

Foundry A. Department has one employee called the pattern storage man. He keeps a record of patterns and core boxes taken from and returned to the pattern storage room. Each morning he delivers the designated core boxes and patterns to their respective departments. He picks up for return to the pattern storage room those core boxes or patterns used the previous day but not listed on the daily work order for that day. If he is unusually busy a general foundry laborer will assist him.

Foundry C. A pattern layout man issues the appropriate core boxes, patterns and flasks.

General Foundry Labor

Foundry A. Four laborers are assigned to general foundry and yard tasks. They move materials interdepartmentally and help with any other tasks within a department. They use wheelbarrows and hand trucks to move materials and the power truck to carry rough castings from the molding department to the clean and ship department.

Foundry B. Six general foundry laborers during the reporting period perform the unskilled labor tasks in the various departments. They move material, haul and mix sand, and work where assigned. They work under the "foundry department."

Foundry C. There were five general foundry helpers during the reported period performing general labor tasks throughout the various departments. They are referred to specifically as "helpers" since the union contract forbids the classification of employees as "laborers."

Custodial

Foundry A. Two watchmen guard the foundry buildings and storage areas and do the minor housekeeping chores in the foundry. The worked a total of 91 hours in the period under study.

Foundry B. Two watchmen are employed, one being primarily a relief man for the full-time watchman. They have chores to do, in-

cluding some regular cleanup. They worked a total of 72 hours in the week under study.

Foundry C. One janitor is employed to clean the foundry premises and the office.

Foundry Housekeeping

Foundry A. No special fume-disfoundry ventilation. However, the windows foundry building has a high ceiling with windowed vents and along the foundry walls. The vents and windows are kept open to give adequate ventilation.

The cleaning department has a unit dust collector used with the table-type airless blast cleaner. This is the only dust control device in the foundry. It has been difficult to control dust effectively in the molding department because of its dirt floor.

Daylight enters the foundry building through the windows along the walls and from the window vents in the ceiling. Incandescent lights are also kept on during all working hours.

An employee shower room is available for the use of all foundry workers at the end of the workday. This shower room was completely remodeled about a year before the study period.

Foundry B. Ventilation is provided by the open window vents in the roof of the foundry building. The only mechanical device used for ventilation is an exhaust fan in the core room.

A mechanical dust collector is used in conjunction with the sandblast hose in the clean and ship department.

Natural daylight enters the building through the window vents in the roof. This light is supplemented by incandescent lighting which is used thorughout the building. Recently, flood lights were installed in the molding department to raise the level of illumnation and to sharpen shadows. This makes it easier to see defects in the sand walls of the molds.

Foundry C. Ventilation of the main foundry building is provided by windowed vents in the ceiling, windows along the walls, and two large four-foot diameter exhaust fans in the roof. The cleaning and shipping room also has an exhaust fan.

Two dust collecting units are used in conjunction with the cleaning machines in the cleaning room. These are the only devices used to control dust in the foundry.

Ample day light enters the building through the windows along the walls as well as through the window vents in the ceiling. Incandescent lights are also used to supply additional lighting if required.

Engineering and Research

Foundry A. The foundry has no engineering or metallurgical research department or employees who spend a major part of their time in such activities.

Product design is determined by the customer and specifications and plans for a new casting generally accompany the order.

For metallurgical research, the company sends several test bars of metal to a metallurgist once a month. If some production difficulty develops during the intervening period an emergency test is ordered.

Foundry B. Since the company's customers supply all the patterns and core boxes there is no need for an engineering or product design staff.

No employees are engaged in metallurgical research. Unless a customer specifically requests a test of the metal being used in its castings the company rarely has the metal tested for its physical or chemical properties. If a test is requested, the company orders a metallurgist's report on a test bar.

Foundry C. There are no employees engaged in engineering or metallurgical research. Metal test bars are sent periodically to a private metallurgist for a report on the physical and chemical properties of the metal. On all government orders, a test slip is required with each order. This test is also performed by the metallurgist.

Inspection

Foundry A. Inspection is visual only and is done chiefly by the foundry superintendent. Working foremen and journeymen molders are responsible for detecting defective castings. Workers in the cleaning department also watch for defects. No special forms are used to record inspection data.

Foundry B. Inspection is visual only. It is the responsibility of the shipper who examines each casting as it is finished by the clean and ship department. No special forms are used to record inspection data.

Foundry C. Responsibility for final inspection of all castings rests with the shipper, although the foundry superintendent constantly examines work in process. Inspection is visual only and no special forms are used to record inspection data.

■The relationships of foundries with their workers has been greatly standardized by unions. In all matters of employment, hours, wages, fringe benefits and the like there is considerable uniformity. But in areas where the unions have not been concerned or where their interest is marginal there is substantial variance.

Communications

Foundry A. No formalized provisions. The company is small and management-labor communicaitons are kept as informal as possible. Usually the president of the company conveys his orders or suggestions to the plant manager verbally. He in turn relates the president's ideas to the foundry superintendent. Production control and scheduling is based on written orders provided for that purpose. Suggestions from the lower levels are made directly either to a working foreman, the foundry superintendent, the plant manager or even to the president if available.

Foundry B. Communications are informal. President is active in the daily operatons of the foundry and if he cannot personally convey an order or an instruction to an employee he informs the production manager who works directly with the working foremen of the various departments. Employee suggestions are generally made to a working foreman although any employee may go directly to the president with a suggestion for an improvement in processing techniques.

Foundry C. Management-labor communications are informal. Company policy is communicated orally by the management to the foundry superintendent who in turn informs all employees. Employee suggestions are made to the foundry superintendent.

PRODUCTION COMPARISONS

- Man-hour data differs between plants
- Here's report on what each foundry made
- Labor accounts also vary

Foundry B; Castings Produced During Study Period

Weight per castings (pounds)	Quantity produced	Total weight (pounds)
Textile machinery castings		
352.00	1	352
340.00	4	1,360
213.00	2	426
202.00	5	1,010
193.00	4	772
148.00	1	148
119.00	2	238
78.00	1	78
71.00	5	355
69.00	3	207
68.00	1	68
62.00	4	248
60.83	6	365
48.00	2	96
33.00	38	1,254
32.00	8	256
24.50	10	245
21.00	12	252
20.40	5	102
20.00	10	200
15.00	6	90
14.18	44	624
8.00	20	160
7.13	8	57
6.00	12	72
4.00	2	8
3.00	4	12
2.00	109	218
1.29	52	67
1.00	67	67
Total textile castings	436	9,407
General machinery castings		
433.85	20	8,677
430.00	20	8,600
285.00	1	285
250.00	5	1,250
197.33	6	1,184
170.00	1	170
123.00	1	123
105.00	1	105
87.00	1	87
86.50	2	173
75.00	1	75
70.00	1	70
67.00	5	335
61.00	1	61
60.00	25	1,500
57.00	1	57
53.00	1	53
50.50	6	303
47.50	6	285
43.00	1	43
42.50	55	2,338
42.29	28	1,184
41.50	2	83
41.00	3	123
40.50	12	486
40.33	3	121
General machinery castings - continued		
40.23	39	1,569
32.50	4	130
29.00	1	29
28.40	5	142
27.50	6	165
26.90	20	538
26.67	3	80
26.50	6	159
25.00	4	100
22.25	4	89
20.50	6	123
17.00	4	68
16.40	5	82
16.00	1	16
15.00	8	120
13.67	3	41
13.33	6	80
12.33	3	37
12.00	73	876
11.67	3	35
11.00	95	1,045
10.00	2	20
9.00	163	1,467
8.00	1	8
7.91	11	87
7.50	6	45
6.00	2	12
5.00	1	5
4.70	67	315
4.63	19	88
4.40	20	88
4.25	24	102
3.50	14	49
3.14	154	484
3.09	55	170
3.00	2	6
2.96	48	142
2.95	21	62
2.69	16	43
2.67	3	8
2.50	6	15
2.43	68	165
2.08	12	25
2.03	36	73
2.00	12	24
1.83	6	11
1.67	12	20
1.21	68	82
1.00	13	13
.93	40	37
.67	12	8
.50	6	3
.36	14	5
.33	12	4
Total - general castings	1,454	36,981
GRAND TOTAL (textile & general castings)	1,902	46,388

■ Man-hour data for all the foundries was not presented as a single table in the original report in order to avoid misleading inexperienced analysts. As experienced foundrymen, however, the readers of MODERN CASTINGS understand that man-hour data for any individual plant must be analyzed in conjunction with the products made at that plant.

Unit Man-Hour Data, 3 Foundries

Department	Man-Hours per 1000 lb. of Good Castings Foundry A	Foundry B	Foundry C
MELTING DEPARTMENT			
Direct man-hours	0.39	0.80	0.92
Indirect man-hours	0.39	1.66	0.92
total	0.78	2.46	1.84
CORE DEPARTMENT			
Direct man-hours	1.17	3.13	6.06
Indirect man-hours	0.78	0.80	0.89
total	1.95	3.93	6.95
MOLDING DEPARTMENT			
Direct man-hours	4.61	11.83	10.49
Indirect man-hours	2.74	2.40	7.24
total	7.35	14.23	17.73
CLEAN AND SHIP DEPARTMENT			
Direct man-hours	2.35		5.56
Indirect man-hours	0.78	4.32*	0.89
total	3.13	4.32	6.45
FOUNDRY SERVICE DEPARTMENTS			
Total(indirect)	4.41	8.70	10.18
TOTAL (ALL DEPARTMENTS)			
Direct man-hours	8.52	15.76	23.04
Indirect man-hours	9.10	18.89	20.14
TOTAL	17.62	34.65	43.17

*Company classifies entire clean and ship department as an indirect function.

The number, weight, and type of each casting made directly affect the unit man-hour data which is based on pounds of good castings alone. A plant producing relatively small castings of intricate design requires more man-hours per 1000 lb of good castings than a foundry making larger but simpler castings.

Manufacturing Costs, 1953

Department	Foundry A	Foundry B	Foundry C
LABOR COST ACCOUNTS			
Monetary payments to all production and related workers plus plant supervisor	35%	62%*	50%
All other costs associated with these employees such as Federal Old Age and Survivors' insurance, workmen's comp, fringe benefits	5%	3%	5%
Subtotal	40%	65%	55%
DIRECT MATERIALS COSTS			
Iron and scrap	20%		
Sand	10%		
Limestone, core oils and binders	2%		
Subtotal	38%	25%	30%
OTHER FACTORY COSTS			
Electricity	1%		
Fuel	3%		
Maintenance supplies and equipment	5%		
Miscellaneous factory cost	13%		
Subtotal	22%	10%	15%
TOTAL	100%	100%	100%

*The year 1953 was not a good business year for the company. The ratio of labor cost to total manufacturing cost was higher than it had been during better business years, when the ratio was usually 50% or less.

Foundry A, Castings Produced During Period Under Study

General identifying characteristics of castings	Weight per piece (lbs)	Quantity produced	Total weight (lbs)
NO. 1: "Floor" Molding Section			
Rectangular downspout shoe, 3" x 4" x 42"	75	5	375
Drainage grate	60	10	600
Manhole covers, 18" diameter x 1½" thick	60	15	900
Trap doors, 18" diameter x 1" thick	40	17	680
Round downspout shoe, 4" x 54"	80	1	80
Round downspout shoe, 4" x 60"	88	1	88
Drainage ditch frame, 3" x 48" long (rail with a supporting ledge. 2 parallel frames support grate)	80	25	2,000
Drainage grate, 18" x 24" x 1"	67	1	67
Rectangular downspout shoe, 3" x 4" x 30"	60	1	60
Rectangular downspout shoe, 4" x 5" x 30"	70	3	210
Rectangular downspout shoe, 4" x 6" x 24"	48	4	192
Rectangular downspout shoe, 4" x5" x 54"	80	1	80
Rectangular downspout shoe, 3" x 4" x 18"	33	7	231
Round downspout shoe, 4" x 60"	80	4	320
Rectangular downspout shoe, 4" x 5" x 60"	90	2	180
Manhole frame	110	2	220
Manhole grate	40	2	80
Rectangular downspout shoe, 4" x 5" x 60"	90	2	180
Locking bars for manhole covers	20	1	20
Gutter for drainage	200	2	400
"T" bar (5" thick, 48" long)	101	3	303
Rectangular downspout shoe, 4" x 4" x 36"	70	2	140
Square manhole frame, 18" x 18"	40	4	160
Rectangular downspout shoe, 4" x 5" x 24"	85	1	85
Total			7,651
Squeezer Machine Molding Section			
Drainage end frame	40	5	200
Drainage end frame	40	1	40
Drainage end frame with corner.	40	1	40
Round downspout shoe, 4" x 18".	30	3	90
Rectangular downspout shoe, 3" x 4" x 12"	23	5	115
Seat bracket for stadium seats.	7½	4	30
Pipe sleeve	25	24	600
Sprocket	5	24	120
Bearing cover (special job)	20	2	40
Manhole steps	10	10	100
Rectangular downspout shoe, 3" x 4" x 18"	33	37	1,221
Pin trims for company mold flasks	12	10	120
Manhole frames, 12" diameter	20	4	80
Vent brick (i.e., for wall opening) 10" x 12"	15	28	420
Manhole frame 12" x 19" (square)	7	3	21
Trap door, 18" x 18"	10	3	30
Lug (anchor for downspout)	2	100	200
Trim for flasks (company's own use)	1½	50	75

General identifying characteristics of castings	Weight per piece (lbs)	Quantity produced	Total weight (lbs)
NO.1: "Floor" Molding Section - Continued			
Rectangular downspout shoe, 2" x 3" x 24"	40	2	80
Manhole cover, 12" diameter x 1" thick	16	3	48
Special item	2	4	8
Seat brackets (stadium)	8	9	72
Total			3,750
No. 2: Jolt-Rollover Section			
Manhole covers, 24" diameter x 2" thick	210	14	2,940
Manhole covers, 24" diameter x 1½" thick	275	8	2,220
Manhole covers, 24" diameter x 3" thick	225	49	11,025
Manhole covers, 24" diameter x 1-1/4" thick	100	75	7,500
(Note: Design differences result in weight differences)			
Drainage grates, 24" x 24" x 1" deep	100	5	500
Manhole covers, 18" diameter x 2" thick	182	9	1,638
Round manhole frame, 18" diameter x 3" deep	27	6	162
Drainage grate	201	8	1,608
Manhole covers, 24" diameter x 1" thick	71	7	497
Manhole covers, 18" diameter x 1½" thick	95	5	475
Total			28,545
No. 2: "Floor" Molding Section			
Trap, 3' long x 2' wide x 2½' deep	420	15	6,300
Manhole covers, 24" diameter, 1½" thick	169	3	507
Manhole covers, 24" diameter, 1" thick	80	5	400
"Y" pipe, 8" diameter x 24" long	160	3	480
Drainage grate, 24" diameter x 1-1/4" thick	160	2	320
Total			8,007
Sandslinger Section			
Manhole corner frame	60	1	60
Drainage ditch grate, 2" x 12" x 48"	195	1	195
Manhole frame	71	2	142
Drainage grate, 2" x 12" x 24".	141	4	564
Modified wheelguard, 6' tall, for garage door frame	200	4	800
Rectangular drainage frame, 2" x 24" x 36"	200	4	800
Rectangular drainage grate, 2" x 24" x 36" (set)	225	4	900
Rectangular drainage hood	180	4	720
Frame	413	4	1,652
Drainage ditch grate, 2" x 12" x 54"	210	4	840
Drainage ditch frame, 2" x 12" x 54"	90	9	810
Manhole cover, 30" diameter x 1-1/4" thick	155	2	310

So, in addition to the accompanying man-hour data, there is listed herewith a complete report on the number and types of castings produced by each plant during the reported period.

The experienced foundryman probably will first examine the differences in manufacturing costs

Foundry A Production (Continued)

General identifying characteristics of castings	Weight per piece (lbs)	Quantity produced	Total weight (lbs)
Sandslinger Section - Continued			
Backplate (for rectangular drainage set above)	140	6	840
Extension (manhole component)	291	3	873
Manhole cover	443	1	443
Manhole cover	200	2	400
Drainage ditch grate	206	1	206
Manhole cover	75	6	450
Grate	100	6	600
Wheelguard	135	4	540
4' frame (a rail with support ledge)	60	14	840
4' long grate (2" x 12" x 48")	130	8	1,040
Grate	80	4	320
Frame (a set)	308	1	308
Grate	310	1	310
Hood	306	1	306
Backplate	143	1	143
Manhole covers	143	5	715
Total			16,127
No. 1: Jolt-Rollover Section			
Frame (manhole), 24" diameter x 8" deep	475	1	475
Frame (manhole), 24" diameter x 8" deep	245	1	245
Frame (manhole), 24" diameter x 8" deep	345	15	5,175
Frame (manhole), 24" diameter	83	4	332
Frame (manhole), 24" diameter x 6" deep	235	1	235
Frame (manhole), 44" diameter x 8" deep	160	1	160
Frame (manhole), 23" diameter x 8" deep	160	1	160
Frame (manhole), 24" diameter x 8" deep	300	4	1,200
Frame (manhole)	275	36	9,900
Frame (manhole)	200	4	800
Frame (manhole)	170	98	16,660
Frame (manhole)	356	1	356
Frame (manhole)	475	1	475
Frame (manhole)	300	1	300
Frame (manhole)	422	1	422
Frame (manhole)	294	3	882
Frame (manhole)	90	5	450
(Note: While depth of different frame castings may be the same, wall thickness varies with pattern and this accounts for the weight.)			
Total			38,227
Grand Total For All Sections-- Pounds of good castings			102,307

Foundry C, Castings Produced During Period Under Study

Weight per castings (pounds)	Quantity produced	Total weight (pounds)
Floor molding section		
2,650.00	2	5,300
1,120.00	1	1,120
1,110.00	1	1,110
890.00	1	890
820.00	2	1,160
618.00	1	618
600.00	1	600
482.00	2	964
475.00	5	2,375
420.00	2	840
380.00	2	760
375.00	2	750
350.00	1	350
301.00	1	301
300.00	3	900
292.00	1	292
275.00	1	275
270.00	3	810
260.00	2	520
255.00	4	1,020
254.00	2	508
253.00	1	253
252.00	1	252
250.00	4	1,000
248.00	1	248
245.00	2	490
240.00	1	240
239.00	1	239
230.00	1	230
225.00	1	225
214.00	1	214
200.00	2	400
180.00	2	360
176.00	2	352
172.00	1	172
168.66	6	1,012
168.00	3	504
157.33	3	472
155.00	5	775
153.33	3	460
127.00	1	127
125.00	1	125
120.00	1	120
117.00	1	117
115.00	4	460
112.00	1	112
110.00	1	110
108.00	1	108
100.00	8	800
92.00	1	92
87.00	1	87
86.00	3	258
78.00	2	156
76.00	1	76
75.00	5	375
70.00	1	70
68.00	2	136
Floor molding section (continued)		
65.00	1	65
62.00	1	62
61.00	2	122
50.00	4	200
34.00	18	612
28.00	2	56
27.00	1	27
Total-floor molding	145	34,314
Machine and bench molding sections		
56.00	1	56
55.00	4	220
34.00	10	340
22.00	4	88
20.00	1	20
19.00	59	1,121
18.00	4	72
15.00	52	780
13.00	18	234
11.50	13	150
11.36	44	500
10.00	112	1,120
8.00	98	784
7.66	12	92
7.00	3	21
6.00	6	36
5.00	24	120
4.00	1	4
3.00	228	684
2.50	348	870
2.29	58	133
2.26	672	1,520
2.15	56	120
2.00	60	120
1.90	32	60
1.80	28	50
1.66	3	5
1.50	418	627
1.48	42	62
1.24	168	208
1.22	112	137
1.00	266	266
0.95	82	80
0.67	3	2
Total- machine & bench molding sections	3,042	10,702
Total- all sections	3,187	45,016

and the unit man-hour data in the accompanying tables and then study the description of castings actually produced in the plants to observe reasons for the differences in data.

He will find that the number of man-hours per 1000 lb of good castings varies substantially between the three foundries. Foundry A requires fewer than half as many man-hours to produce a given poundage as Foundry C and barely half as many as Foundry B. But these comparisons are only presented to invite further investigation. They do not necessarily reflect on the respective efficiencies of the three foundries investigated. Incidentally, the Department of Labor assures us that all three are "efficiently operated."

Foundry Staffing Patterns

Department	Total Production and Related Workers Foundry A	Foundry B	Foundry C
Melting	2	2	2
Core	5	5	8
Molding	19	18	20
Clean and ship	8	6	7
Service departments:			
Patternmaking	2	11	2*
Maintenance	2		2
Pattern storage	1		1
General foundry labor	4		5
Custodial	2		1
TOTAL	45	43	48

*Pattern repair and flask maintenance.

COMMON SENSE in QUALITY CONTROL

In small bronze foundry simple controls pay for themselves in few days

HARRY C. AHL/*Project Engineer*
National Bearing Division
American Brake Shoe Co., Meadville, Pa.

■ Bronze founders generally associate quality control with high overhead cost and foundry burden. Most bronze shops are small and unable to hire engineers to direct quality control programs.

The small shop (less than 25 people) can be excused from hiring a technical person for quality control. However, the best of quality control programs can be established in the small shop (one without a metallurgist) if top management honestly desires to improve practices. With raw materials prices at their present levels, there is no place in our competitive industry for management with other ideas.

Customers of bronze shops are receiving better castings than at any time in history and they are demanding even more quality. A well run quality control program is almost mandatory to keep up with these demands in the face of rising production costs.

My pet definition of quality control is: "The science of repeatedly producing quality bronze castings at the least possible production cost." Some may argue that this is a better definition for production control, foundry practice, or bronze foundry management control; however, like these, quality control cannot be isolated to any one department or floor. It must be thoroughly understood from top management to the helper on the floor.

Top management must know why control is necessary and where and how to apply it. The helper must understand his part in the over-all picture—if this is keeping spillings or turnings separate, he must realize that all brass is not just brass, that each alloy is different and in most cases, for a quality job, incompatible with another.

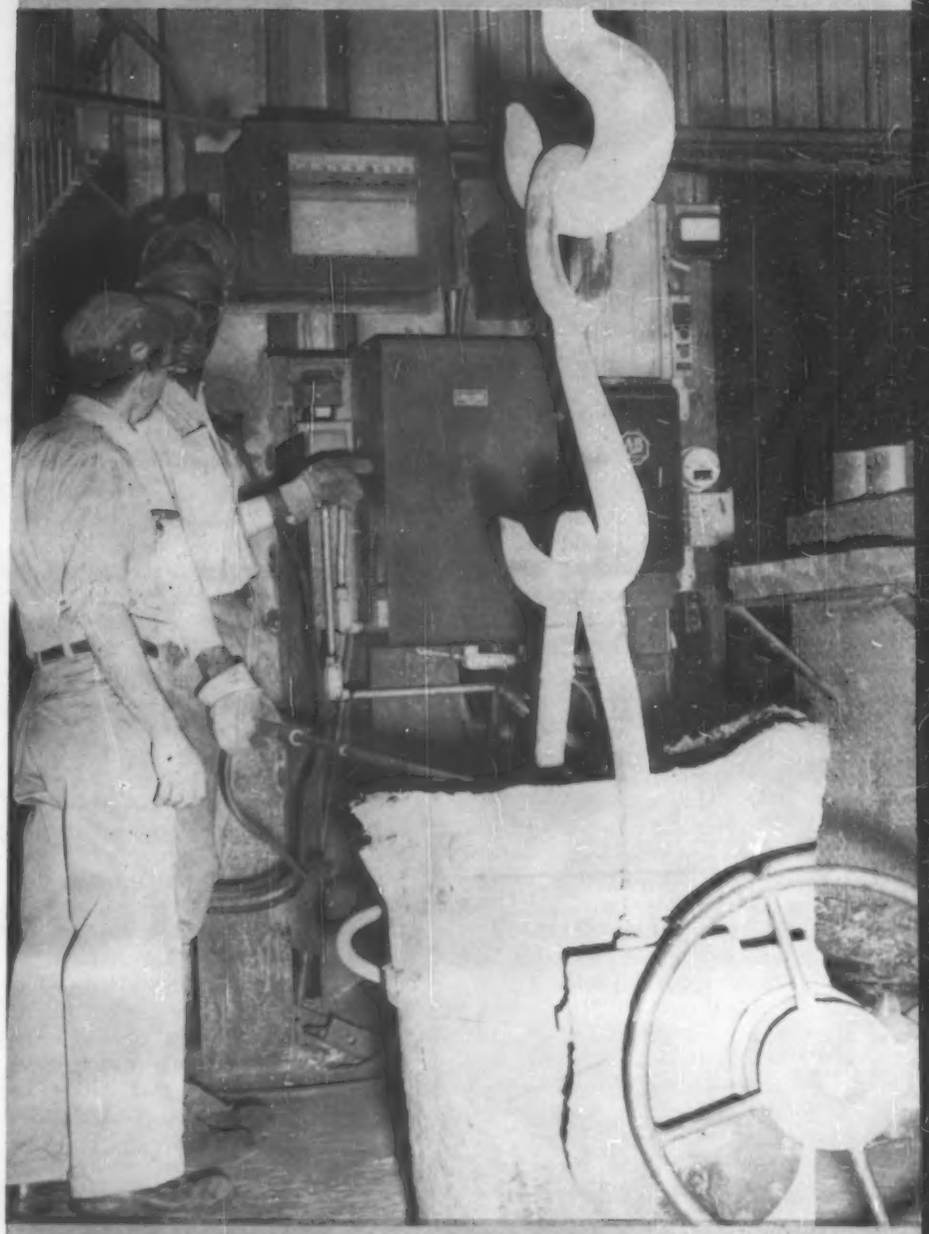
In the small foundry, it will be up to top management to set up and follow control programs. In most of the shops I have had experience with, there was at least one unusally talented person who could be appointed to head up a well-defined quality control program. This can be a collateral duty, but it is much more desirable to make it a full time responsibility. The position must carry authority to make changes in shop practices calculated to produce a better product.

The program could include control of the quality of raw materials, melting, sand, gating and risering, pouring, shakeout, cleaning, and defective casting analysis. Large expenditures are not required to realize a profit. Let's look at these applications individually on a small operation.

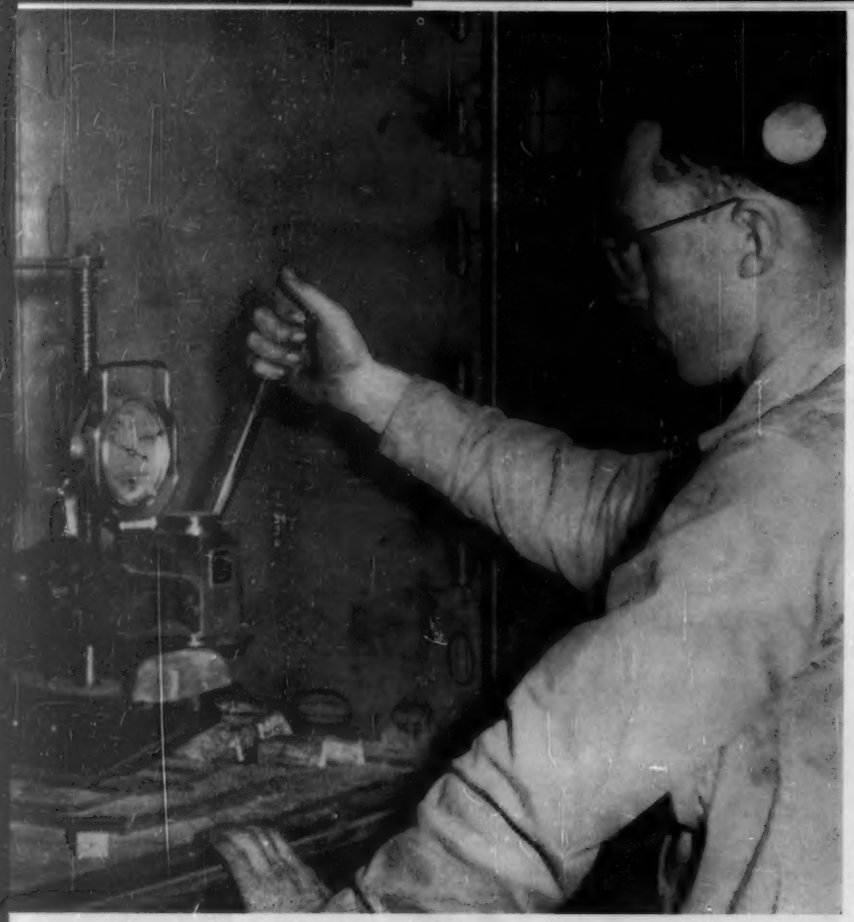
Control of material. Most shops purchase pre-alloyed ingot which generally has very high quality. In spite of this, some shops still check the ingot. Although this is not absolutely necessary, I believe it is a good thing.

Ingot is generally checked in the foundry by visual appearance, i.e. color, freedom from a surface dirt and slag, and texture and color of fracture. Most ingot producers will assist you in setting up this kind of control.

All foundries must realize gates and risers as part of their charge. These can create havoc if left uncontrolled and unmarked. Although a number of people claim to be able to tell the composition of all brass and bronze alloys by



Permanent pyrometric controls convenient to melting and pouring areas.



Alloy quality check with accurate, quick, inexpensive hardness test.

their color, I would be wary of trusting this method for absolute control. However, most alloys can be distinguished one from another by a trained eye viewing new fractures.

A better method, by far, is the segregation of gates and risers by alloy in the cleaning room before sending them back to the charging floor. Mixing is still possible, but if segregation is properly carried through, a reasonably good control of scrap charges can be maintained.

Many shops mark all gates and risers as well as scrap castings by various means including chalk, copper tabs, and colored paint.

Melt quality. Many shops rely solely on the eye of the furnace operator to determine when the furnace atmosphere is right, when the metal is at pouring temperature, when and by what degree to deoxidize. A few furnace men have this ability, but I would not wish to depend entirely on their opinion. There's a simple, inexpensive aid to controlling each aspect.

To determine correct atmosphere, we have the color of the flame test and the zinc test. If a small piece of zinc held briefly in the flame has colored from gray to black, you're melting under reducing conditions. For most operations, this spells trouble. If it remains bright, the atmosphere is oxidizing and you are usually not in difficulty. The fuel-air mix is adjusted until the atmosphere will prevent coloring of the zinc.

Because furnace atmosphere does not remain the same throughout the melt, it should be checked several times during the melt cycle.

The second aid is the pyrometer, probably the most useful tool in the foundry. Most of the many makes of these temperature measuring devices on the market are very reliable. If you do not have a pyrometer, run out and buy one, for it has been proven beyond a doubt that pouring temperature of a copper-base alloy has more to do with making good castings than any other single variable.

Too high a pouring temperature can result in porous, leaky castings due to abnormal shrinkage, absorption of hydrogen gas giving rise to gassed castings, or loss of alloy such as zinc or tin. Any one or a combination of these effects causes losses that are entirely avoidable with good pyrometer practice.

Unfortunately, there are shops with the best of pyrometers that do not use them properly. The pyrometer should be kept in calibration. For most shops, this means a maintenance set-up with the local supplier. Instruments should be checked as often as your particular practice dictates—the manufacturer can help you with this.

In our field, we can utilize only the immersion type pyrometer. Tips should be kept clean and free of adherent metal. This can be accomplished readily by running the tip through an installation of wire brushes near the pyrometer station, immediately upon removal from the heat. With good maintenance, pyrometers are literally "worth their weight in gold."

The third aid is a very simple fracture test to determine melt quality, and if you can pour and break in time, to avoid pouring a low quality heat. It isn't always possible to complete the fracture test and raise the quality of a heat before pouring—but even here cleaning and machining time and costs on defective castings may be avoided.

A great deal of work has gone into developing the American Foundrymen's Society standard fracture test for brasses and bronzes; I think it's good. It is relatively simple and fast and, in most cases, allows the melter to raise melt quality before pouring.

Many foundries have their own fracture test which satisfactorily controls their particular operation.

The AFS fracture test of 85-5-5-5 will show blue-gray material if the heat is of high quality; low quality appears as a reddish colored dendritic structure. For a complete discusion of the test, refer to Baker, Upthegrove and Rote, "Melt Quality and Fracture Characteristics of 85-5-5-5 Red Brass," TRANSACTIONS, American Foundrymen's Society, v 58, 1950, p 122.

Molding sand is often considered a tool of the molder and is completely controlled by him. In too many cases, this results in cast-

Properly used sand lab should return the investment in a month or two.

ing defects and scrap.

Sand must be considered one of the raw materials. It has definite properties which, in most cases, can be controlled. Moisture in molding sand is of prime importance, because of copper alloys' affinity for hydrogen and oxygen. Wet sand can easily cause a gassed casting even though the metal was in good shape when poured.

Most distributors of foundry sand can tell you the expected properties of your sand when properly tempered, but no one can forecast how moisture will vary from heap to heap. If temper is controlled other sand properties will, for the most part, fall in naturally.

Where costs preclude the purchase of a complete sand testing outfit, or where there is no technician, controlling moisture with simple, inexpensive equipment goes a long way towards reducing scrap.

I saw moisture measuring equipment costing about $150 pay for itself in several days by reducing sand blows and cold shuts attributed to high moisture. We had such good luck with this one test that we purchased equipment to determine mold hardness, tensile and compressive strength, and permeability. We then kept all heaps within specifications with bi-weekly checks on each heap and cut overall scrap 1.4 per cent.

If monthly operating costs were $18,000, reducing scrap by 1.4 per cent amounts to a direct savings of approximately $3000 a year. It is not unusual for a small shop to have a gross of 1.5 per cent of their scrap due to uncontrolled sand.

Gating and risering. I feel that a casting, no matter how closely controlled, is only as good as the feeding technique used. A good quality control program will include gating and risering as one of its functions.

Due to diverse opinions on gating technique for any given casting, some shops hold regular, short morning meetings of all involved to determine best practice. A record should be kept of the exact system used; if a good casting results, a permanent record should be made and referred to on repeat orders. Following this procedure in our shop has contributed to high quality products being made right the first time.

Especially in a jobbing shop, the loss of a single casting may eat up the profit of an entire order.

The permanent record should include pouring temperature, ladle additions, etc. A self-developing camera is a handy way to record operations and gating and risering.

Asking the expense of quality control is much like asking the cost of health. None of us considers it an unwarranted expense to go to a doctor when ill. We assume he will heal us and send a bill. True, it may be expensive, but we're well, so it's worth it. I like to think of the expense of quality control in this manner. If it reduces scrap, or if it heals sick operating conditions, it's worth it.

Control expenses depend upon the extent of quality to which the shop aspires. Small foundries lacking proper guidance and knowledge of exactly what quality control should do, may overburden themselves with unnecessary features and equipment. I call this, too much versus too little—that is, too much in the way of equipment and too little in the way of use.

Three degrees of quality control can be entitled "no cash outlay, but improved supervision," "low cost facilities to decrease casting losses," and "complete laboratory encompassing product development."

The first degree may be as far as some small shops may care to go. Here the head of quality control simply determines trouble spots throughout the shop and recommends remedial measures.

Perhaps the melting department has not been properly trained in metal segregation, furnace operation, or melting conditions. It may be that the cleaning room is sloppy in sprue cutting or cleaning, or they may not be examining castings for defects before machining. He instructs shop supervisors on precautions, and where and when to expect trouble.

If he is not conversant with all aspects of foundry practice, he should refer to AFS publications such as COPPER-BASE ALLOYS FOUNDRY PRACTICES and MELT QUALITY & PRESSURE TIGHTNESS OF COPPER-BASE ALLOYS.

Although improved supervision pays for itself many times over, a good small shop quality control program should include a small cash outlay for some small, low-cost equipment. As situations are improved by better supervision and scrap losses are still excessive for indeterminable reasons, the point is reached where investment in

Check ingot by color, freedom of surface dirt and slag, and fracture color and texture.

Catch soft rammed molds with mold hardness testing.

Above . . Pouring temperature—copper alloys most critical variable.

PART -3rd and 4th STAGE TORPEDO CYLINDERS PATTERNS -166304-5
MATERIAL -Spec. 165 USN (Comp. M) 184305-30
FURNACE -Electric and Coke 185426-36
POUR.TEMP.RANGE-2080° F. Min.
2120° F. Max.
POURING TIME -20 - 30 sec.

LADLE ADDITIONS

Furnace	Zinc	F-Cu Shot
Electric	8 oz./100#	1 oz./100#
Coke	8 oz./100#	2 oz./100#

MOLDING PRECAUTIONS

1. All sand surfaces coming in contact with metal to be faced with Zircon Sand mix containing the following ingredients:

Zircon Sand	100#
Kordek	46 cc
Dixie Bond	200 cc
#167 Penolyn	1 pt. (1#)

The Back-Up Sand is regular #60 oil sand and the mold is washed with the regular graphite wash.
2. All internal cores, except the bore core, are made of the above Zircon sand mix. All cores washed with the regular graphite wash.
3. The Bore Core is machined from a graphite electrode and coated with Oilsea Core Wash.
4. Chills - Approx. 50 1/4" x 1/4" x 3" chills should be placed on the inside dia. of the jacket core. It was also decided to chill the flange face (drag side) because several castings leaked in this area.
5. A Green Sand cope 18" high is used for the Riser Pouring basin and downgates.
6. Gating and Risering: (Refer to photographs)
Downgates - Two (2) 1" Dia.
Riser - One (1) 18" high - oval (other dimensions vary with different cylinder)
Runners - Two (2) 3/8" x 1" x 5"

Left . . Standards card prevents difficulties with problem castings. Ingersoll Rand Corp.

equipment is most rewarding. Examples are the moisture teller and pyrometer already mentioned.

A rather complete sand lab costing only about $1500, should return its value within a month or two if properly used. As with all things, equipment is no better than the efforts put forth to make it tell the story. The lab could be run efficiently by someone in the shop (not necessarily a technician) who is interested in sand control. However, a technician could not only carry out the progam of sand supervision pretty much by himself, but he could also handle other quality control jobs and coordinate all data on scrap castings.

Regardless of his mental capabilities or of the equipment at his disposal, the technician must become thoroughly familiar with every foundry operation before he can possibly do a good job of quality control.

I have acquaintances who built beautiful buildings and spent many dollars for nice looking testing equipment only to disregard laboratory reports. These showpiece labs were a burden that eventually forced closing and sale of equipment.

If management does not want to look at mistakes, to study them and try to improve through control devices, expenditures for control equipment cannot be justified.

The next natural step in a quality control set-up, providing funds justify it, is the building of a large laboratory. I do not mean large buildings, but rather the installation of chemical and physical controls in addition to sand controls, and perhaps non-destructive testing.

This can be expensive if left in in the hands of someone who purchases everything the salesman would like to sell. A complete laboratory, capable of handling any and all problems that may come to a small bronze foundry can be set up for much less money than the average man would consider. All this equipment makes mandatory the hiring of a technician. One who can design, build, and install a complete lab and train operators cannot be hired for pennies, although here again, there are many who can be hired for something less than most people consider.

Just exactly what goes into the complete lab depends upon what is wanted from it. The average small foundry cannot afford to make it a research lab. Unless the foundry does a great deal of specification work and provides chemical analyses certification with the product, a chemical lab is unnecessary; especially if prealloyed ingot is melted. A physical test laboratory is much less expensive than a chem lab and in most cases will do as much, test bar-wise, as a complete chem analysis.

Product Development Neglected

A major field in which brass foundries have been most negligent is that of product improvement and development. This should come under quality control, but not necessarily as a production control. Before product improvements can be made, shortcomings of current production must be determined.

If you manufacture valves and the scrap rate overall is five per cent, proper quality control can tell why you have this loss. It may develop that a valve of simpler or even more complex design will be a better casting, have better castability, machinability, and give better service to the customer in the long run.

This is exactly what our associate industries have done. They have learned though quality control that certain designs are high loss items. They have learned what can be done to improve the casting and have carried it to the customer to justify design changes. This long arm of quality control may not interest you right now, but under proper conditions it is a natural result of a good set-up.

Let's see what quality control did for a casting for an extensively machined device selling for about $4000. The cost of this device, including overhead but not sales commissions, is $3500. This leaves a margin of $500 per casting.

Prior to control of any type, the

loss on this item for the first 75 castings was 10 per cent. Obvious defects were off-chemicals and physicals, contaminated metal, shrinkage, and heavy scabbing on cored surfaces.

The obvious step was to work with the foundry production manager and his foremen to clean their skirts before doing anything about off-chemical analysis, installing a laboratory, or any such expense. Nothing but improved supervision and inspection cut casting loss from all sources to five per cent for the next 75 castings—an improvement of 50 per cent.

Although scrap was not considered excessive, managment installed a lab to run complete chemical and physical tests. An outside lab had been charging a reasonable $16 per test, but the company could do it for $12. On the next 300 castings a savings of nearly $6000 in machining costs alone was realized.

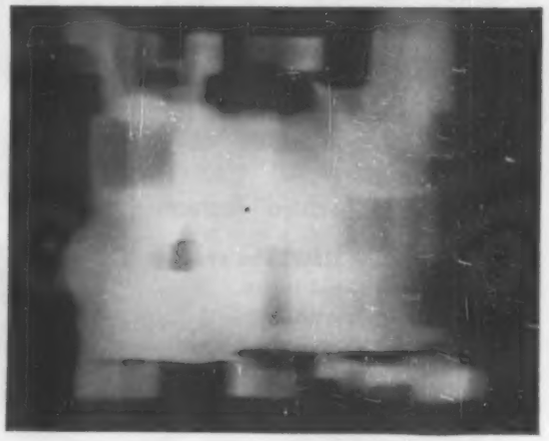
By checking core sand mixes as well as molding sand mixes, and religiously adhering to specifications set up with the aid of the sand supplier's engineers, scabbing and sand-associated defects were completely eliminated. Metal segregation practice was improved. Metal was poured at proper temperatures. A fracture test was instituted to determine melt quality.

Overall loss settled to a constant 2.7 per cent. I understand they are down around 2 per cent, indicating there is continued interest in quality control and increasing success in control of foundry variables.

Refractory Papers Slated

Five papers on refractories will be presented at the 1956 AFS Castings Congress by the Refractories Committee of the American Foundrymen's Society.

Progress of the Foundry Refractories Manual now being prepared by the committee and the technical papers were discussed at a meeting of the committee held recently in Chicago. Topics of papers under consideration include gun placement of cupola refractories, air furnace refractories, electric furnace refractories, and refractory consumption.



Sound casting yield jumped from 50% to 96%...

when radiography pointed the way

A jet plane fuel pump called for this intricate casting. The alloy was 355 AMS4214—often prone to gas holes and shrinkage. Rejects from the initial supplier ran as high as 50 per cent.

Then Oberdorfer Foundries undertook to do the job. By studying radiographs made of pilot castings, they developed new methods of gating and position of chills. Sound casting yield rose to 96 per cent. Costs dropped. And an enthusiastic customer became a firm friend.

This is typical of the ways radiography can improve foundry operations. It points ways to better castings. It saves countless hours of expensive machining by exposing castings not worth the work.

If you'd like to talk about radiography—discuss how it could help you, get in touch with your x-ray dealer. Or if you like, send for a free copy of our booklet, "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

RADIOGRAPHY...
another important example of Photography at Work

Kodak
TRADE MARK

CIRCLE NO. 136, PAGE 69-70

BY POPULAR DEMAND!

fine FANNER King Size

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with these "wanted" features

Cover FOUR TIMES the area, of conventional large head foundry nails

Requires 1/4 of labor-setting time

Lighter weight — more pieces per pound

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Available in 1" round or square head
Sizes: 7/8" to 2 1/2" long
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Fine FANNER King-Size Scab Nails shown here are actual size

● Foundrymen everywhere are hailing the arrival of a new "king" — Fine FANNER King-Size Scab Nails. New FANNER King-Size Scab Nails can be placed on the pattern and rammed, eliminating hand setting of nails after pattern has been rammed. Square head King-Size Scab Nails can be grouped together to completely cover a given area . . . can be used to excellent advantage at gate areas. Molds can be nailed or covered right into the corner with the square head. FANNER King-Size Scab Nails can also be used as chaplet bearing surfaces in green sand molds. For better castings at lower cost, use these new FANNER King-Size Scab Nails — write for samples and prices today!

THE FANNER MANUFACTURING CO.
Brookside Park Cleveland 9, Ohio

Casting Tolerance Views Of a Chief Inspector

■ The inspector and the foundry do not always work to the same specifications.

All too often castings are ordered by Purchasing with inadequate and even misleading or down-right incorrect information. It rarely occurs that Inspection checks purchase orders; however, sometimes this is done by Engineering. A purchase order should quote the related drawings and specifications in full detail as well as delivery schedule and special conditions.

Where volume of castings warrants it, sample castings should be run off and given to the customer for inspection and machining. Based on his comments, go ahead or make changes and submit another sample.

Main causes for casting rejection are:

1 . Dimensional errors including our old favorite "not enough material to clean up."

2 . Metallurgical errors including improper thermal treatment, wrong material, too hard or soft.

3 . Foundry errors such as improper cleaning, shrinkage, porosity, off-center cored holes, undesirable chills, warpage, and blows.

From an inspector's point of view, dimensional control can only be considered to have been achieved when an actual physical measurement by a layout inspector shows the casting within limits.

The author's firm shoots for the following gray iron tolerances based on casting length:

Casting Length	Tolerance
less than 6 in.	± 1/32 in.
up to 12 in.	± 1/16 in.
up to 24 in.	± 3/32 in.
up to 36 in.	± 1/8 in.
up to 48 in.	± 5/32 in.
above 48 in.	± 3/16 to 1/4

These tolerances, of course, are on top of any machining allowance.

By working closely with the customer and obtaining cooperation from designer, patternmaker, foundryman, and inspector, tolerances can usually be cut in two.

From a talk by J. T. Gilman, chief inspector, Canada Iron Foundries, Ltd., Montreal, Que., before the Eastern Canada Chapter of the American Foundrymen's Society.

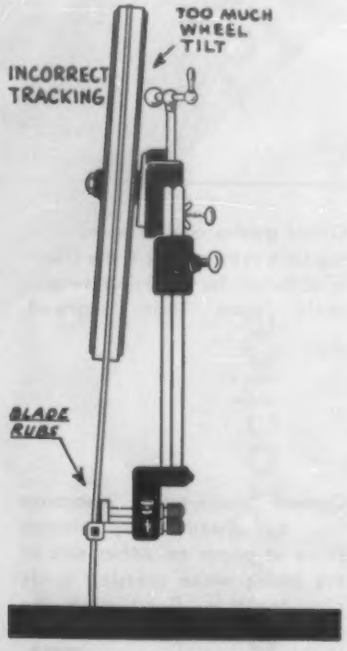
CIRCLE NO. 137, PAGE 69-70

Band Saw Breakage

■ Most blade breakage on band saws is due to human errors.

In some cases blade breadage is unavoidable, being the result of peculiar streses to which such saws are subjected. But it is more often due to the following avoidable causes:

Insufficient tooth separation and/or set
Excessive blade tension
Faulty guide alignment
Unevenly worn guides
High-set guides
Fast feeding
Short-radius cuts
Unfinished welds
Worn wheel tires



Wheel tilt causes the blade to ride hard against the support, case-hardening the back edge and leads to early blade failure.

A band saw blade is a delicate piece of steel which, when moving at 4000 fpm and cutting a wide variety of materials, is subject to tremendous strains. Proper treatment, the best assurance of long service life, will be assured if the operator heeds the following recommendations:

Proper Blade

Select blades of the proper thickness and temper for the machine. Be sure that it has the correct tooth set and has sufficient tooth separation. Use the widest blade possible, but use narrow blades for small, abrupt curves and delicate work.

Sharp Blade

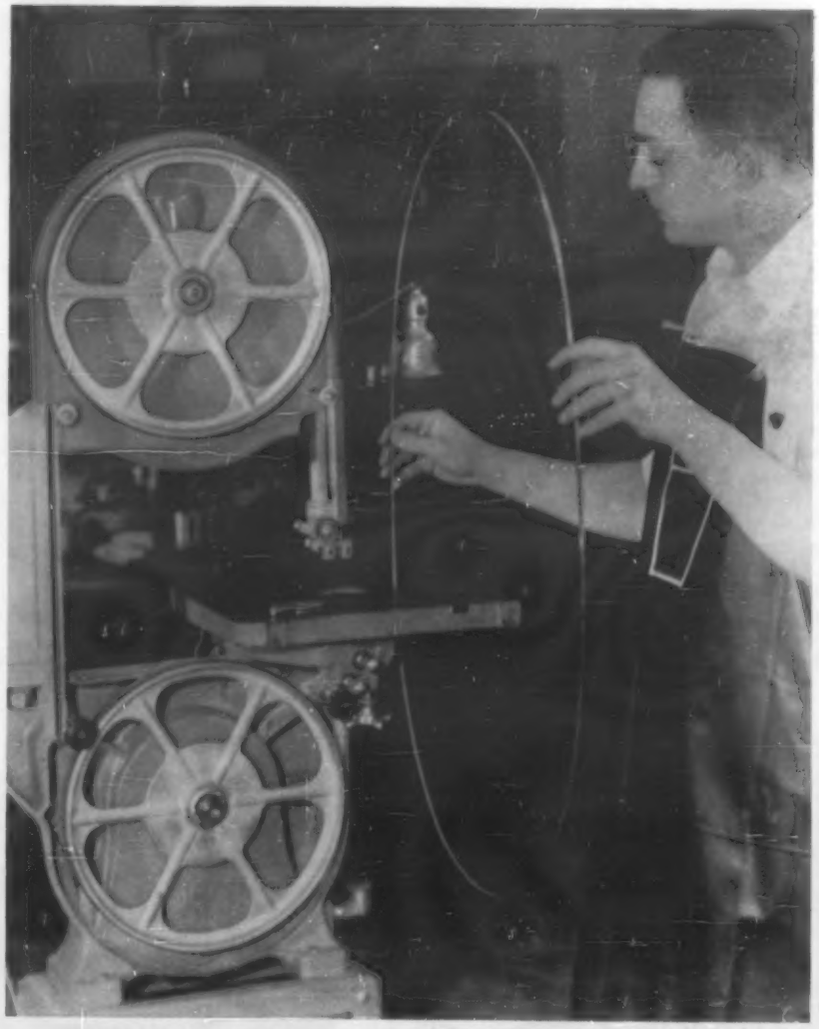
The blade is not expected to stay sharp, but the operator is expected to use a sharp blade, so sharpen the blade when it grows dull. Don't wait for it to become unsalvagable; don't make inefficient use of a dull blade.

Under average conditions, blades should be sharpened after about four hours operation. "Hard-edge" blades for metal cutting should be discarded when worn as sharpening isn't practical.

In centering the blade, revolve wheels slowly forward by hand to make sure the blade travels in the center of the tires. Never do this while the machine is running. After the blade has been tracked in the center of the wheel rims, lock it firmly in place.

Blade Tension

Over-straining the blade is a common cause of breakage and poor performance. Tension on the blade should vary with its width, and for different kinds of blades and work.



Band saw blade breakage is largely avoidable. Long, fault-free service and accurate performance is assured when a reasonable amount of care and judgement are used in mounting and adjusting the blade and guides.

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CIRCLE NO. 138, PAGE 69-70

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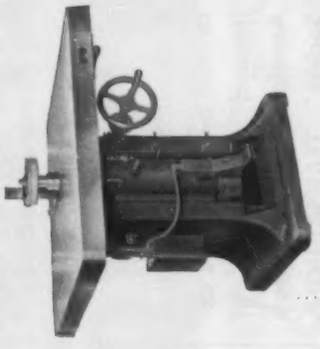
CIRCLE NO. 139, PAGE 69-70



Band Saw Breakage

Intelligent use of the tensioning gage eliminates many of the more common blade troubles. Always relieve blade tension when the machine is idle.

Setting the Guides

Adjust brackets carrying guide blocks forward until front edges are just behind the teeth gullets. If guide blocks are too far forward, teeth will be damaged. If too far back, the blade will not be correctly supported for curve-cutting.

Set guide blocks close to the blade sides without binding. When the blade is running free without cutting there should be about 1/64-in. clearance between the back of the blade and the blade support. If allowed to run hard against the support all the time, the back will become casehardened, and eventually break.

Readjust the guides every time the blade is changed, especially when blades of various widths are used.

Always keep the top guide down close to the work. High-set guides ask for trouble.

After considerable use, guide blocks become worn at their front edges, tending to bind on the rear of the blade. Original accuracy may be obtained by reversing ends. When both ends are worn, grind them square or install new guide blocks.

Before starting the machine, re-check adjustments and place guards in position, then turn pulley by hand to make sure everything is in order.

Feeding

Do not force material against the blade too hard. Light contact will permit easier following of the line and prevent undue friction, heating, and case-hardening of the back edge of the blade.

Very little pressure is required for average cutting when saw teeth are sharp. In any case, move stock against the blade steadily and no faster than necessary for easy cutting movement.

Wood-cutting blades should be filed and set when pressure is required to make them cut.

Short Radius Cuts

Avoid twisting the blade by sawing around sharp corners. Use widest blade possible, but be sure it is narrow when cutting small, abrupt curves, and when work is delicate, or fine.

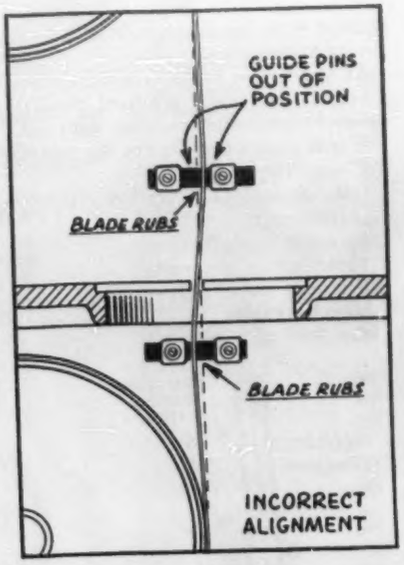
When cutting curves, turn the stock carefully so the blade will follow without being twisted. If a curve is so abrupt that it is necessary to back up and cut a new kerf repeatedly, either use a narrower blade or one with more set. Although a blade with more set will make it easier to turn the stock, the cut will usually be rougher.

In withdrawing the piece being cut, take care not to draw the blade off the wheels. In most cases it is easier and safer to turn the stock and saw out through the waste material than to withdraw it from the blade.

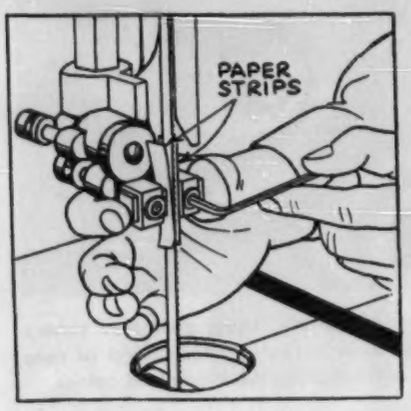
Broken Blades

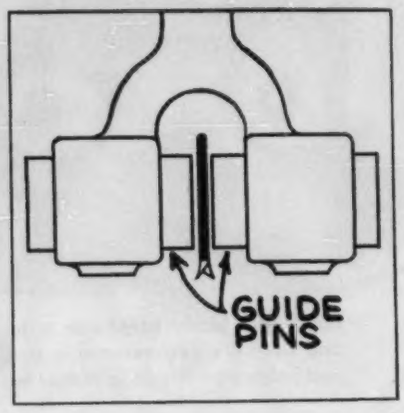
Broken blades can be brazed or welded, but if the blade has become badly case-hardened, it will soon break in another place. Do not use a repaired blade until the bump or bead of braze or weld has been properly finished.

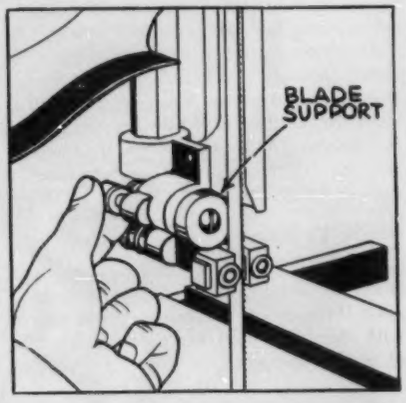
Condensed from material supplied by Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.



Offset guides can be avoided at the time they are set if the blade is stiffened by straining temporarily more than required.







Correct blade-guide clearance can be obtained by placing strips of paper on either side of the blade while pressing guide pins together. Don't push the blade out of a vertical position. Now set the blade support 1/64-in. away from the blade back.

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CIRCLE NO. 140, PAGE 69-70

Flooded Foundries Need TRANSACTIONS

■ Foundries recently devastated by floods have exhausted the supply of American Foundrymen's Society TRANSACTIONS for the period since 1945.

■ If you would like to sell volumes of this period write: Book Department, American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill.

Pitfalls of Foundry Practice

PAUL R. FOGHT/*Assistant Editor*

■ Pitfalls of foundry production and measures for avoiding these pitfalls were discussed at the 8th annual Metals Casting Conference held at Purdue University, West Lafayette, Ind., November 3–4. The program was sponsored jointly by the Michiana and Central Indiana chapters of the American Foundrymen's Society and by Purdue's School of Chemical and Metallurgical Engineering and Division of Adult Education.

Conference activities were set up under the leadership of J. P. Lentz, International Harvester Co., Indianapolis, conference chairman; Robert H. Greenlee, Auto Specialties Manufacturing Co., St. Joseph, Mich., program chairman; and Carl O. Schopp, Link Belt Co., Indianapolis, assistant program chairman. 190 foundrymen registered for the two-day meeting at Purdue Memorial Union.

190 came to dinner

Time has come to talk of pitfalls and practices with F. W. Shipley, AFS vice-president, R. H. Greenlee, program chairman, J. P. Lentz, conference chairman, and C. T. Marek, Purdue's Michael Golden lab.

The pitfalls discussed by the speakers were those that lie in human relations, foundry sands, gases in metals, risering and control of metal in melting.

The conference was officially opened by Dr. Reinhardt Schuhmann, Jr., School of Chemical and Metallurgical Engineering, Purdue, who presented the theme of the conference, "Pitfalls of Foundry Production."

Dr. A. R. Spalding, head of the freshman engineering program at Purdue, officially welcomed the conferees to the campus. He stated that the metal processing industries and metallurgy may be the keystone of all future industrial progress. He then called attention to the need for conferences of people in these industries to enable them to keep pace with activities.

F. W. Shipley, Caterpillar Tractor Co., Peoria, Ill., vice-president of AFS responded to Dr. Spalding's welcome. Purdue grad Shipley stressed the importance of industrial conferences by stating that "you can't make progress by yourself."

Feature presentation of the first morning's session was *"Fundamentals of Humanics,"* a speech by Ralph L. Lee, Lee Hobby Foundry, Birmingham, Mich., who appeared through the auspices of General Motors Corp.

Dr. Lee remarked that "in spite of all changes, the one thing that will not be obsolete is the foundry people out on the job." He stated that the improvements that can be made in human relations with these people are greater than all technical advances. Lee presented 16 fundamentals of a good leader and closed by observing that all leaders he has met "have found in their work a means of earning a living and a reason for living."

The afternoon technical sessions were devoted to a discussion of the *"Accomplishments of AFS Sand Committees,"* presented by O. Jay Myers, Archer-Daniels-Midland Co., Minneapolis, and to a description of *"Gases in Metals"* by Dr. Norman A. Parlee, School of Chemical and Metallurgical Engineering, Purdue.

Sand Division History

O. Jay Myers reviewed the history of the AFS Sand Division, largest of the society's eight technical divisions. Myers, chairman of the division, listed the accomplishments of the 26 committees that make up the division, and invited Indiana foundrymen to join in the activity. Myers stated that the sand division is working for casting quality.

Myers' remarks were amplified by a report from the floor by E. C. Zuppann, Oliver Corp., South Bend, Ind., chairman of the Sand Division's Malleable Iron Committee. Zuppann reviewed his group's study into pin hole porosity of malleable iron.

Chairman of this technical session was Stephen Taylor, Electric Steel Castings Co., Indianapolis.

Dr. Parlee stated that the foundryman can't know enough about gases in metals. He discussed the mechanisms and conditions by which gases like H_2, N_2, O_2, CO, SO_2, H_2O, H_2S, and CO_2 dissolve in metals and are evolved from metals. Parlee gave special attention to the amounts of oxygen, nitrogen and hydrogen which dissolve in iron alloys. He cautioned foundrymen that tiny percentages of gas by weight represent very large volumes; 0.0027 per cent of hydrogen by weight dissolved in iron can be evolved to occupy 15 times the total volume of the iron.

Parlee also discussed the effect of these dissolved gases on iron alloys and mentioned methods of avoiding or eliminating harmful effects on the finished product. He stated that he suspects many heavy castings show porosity due to nitrogen in the metal. This same nitrogen, he said, may cause much of the trouble now blamed on hydrogen.

Content

Professor C. T. Marek, Michael Golden Laboratories, Purdue, was chairman of the session at which Dr. Parlee's paper was presented.

The conference banquet was held at the Purdue Memorial Union Thursday night. Dr. Reinhardt Schuhmann, Jr., was toastmaster and introduced the evening's speaker, Dr. M. B. Ogle, Jr., head of the Department of History, Government and Philosophy at Purdue. Dr. Ogle's topic was, *"People, Politics and America."*

The American system, said Ogle, was never really planned to do what it does, yet it is the most delicate and effective system of giving most of the people the most of what they want. In describing political leadership, Ogle remarked that you needn't assume responsibility for political leadership, but

if you don't do it someone else does.

Charles F. Walton, Gray Iron Founders' Society, Cleveland, presented *"Principles of Risering"* at the first technical session Friday morning.

Walton advised foundrymen to think of risering and gating before thinking of the pattern for a job. He stated that salesmen should stress the production of the cast shape in talking to buyers of castings, because the sooner attention is placed on producing the cast shape, the better the ultimate job.

W. E. Patterson, Elkhart Foundry & Machine Co., Elkhart, Ind., was chairman of the session.

"Control of Metal in Melting" by Phillip M. Semler, Auto Specialties Mfg. Co., St. Joseph, Mich., was the second technical paper presented Friday morning.

In introducing his subject, Semler remarked that the quality of metal being melted in the midwest currently is lower than usual because of the effort being made to meet demand for castings.

Semler stated that equipment, material and personnel are three individual control problems that must be solved in developing quality control of metal in melting. He stated that both coke and scrap may be misused in the cupola, but scrap is more often misused than coke. He recommended that the melter draw up specifications for the purchase of scrap.

In concluding his paper, Semler stated that quality is not something a plant can start today and have tomorrow.

Chairman of the second Friday morning technical session was James C. Maggart, Sibley Machine & Foundry Corp., South Bend, Ind.

Final technical paper was presented by Earl E. Woodliff, Foundry Sand Service Engineering Co., Detroit, whose subject was *"Molding Sands."*

Woodliff observed that many foundry sand problems stem not from sand control but from the equipment now in use in the plants. He mentioned the elimination of riddled facing over the pattern, excessive removal of fines, lack of tempering time for sand, and excessive mulling as defect-causing trends in current equipment design.

Woodliff stated that sand control is not sand testing, it is the selection and use of materials. The most important phase is the selection of the proper materials for your job.

Members of the conference committee who assisted chairmen Lentz, Greenlee and Schopp were: K. E. Glancy, Division of Adult Education, Purdue, R. W. Lindley, Michael Golden Laboratories, Purdue; C. T. Marek, Michael Golden Laboratories, Purdue; Victor J. Obrig, Fabricast Div., General Motors Corp., Bedford, Ind.; W. E. Patterson, Elkhart Foundry & Machine Co., Elkhart, Ind; R. Schuhmann, Jr., School of Chemical and Metallurgical Engineering, Purdue; Stephen Taylor, Electric Steel Castings Co., Speedway, Ind.; Howard B. Voorhees, Buckeye Product Co., Mishawaka, Ind.; James C. Maggart, Sibley Machine & Foundry Corp., South Bend, Ind.

casting through the ages

FED UP WITH THE WIDELY VARIED SIZES AND STYLES OF CANNON CAST BY ENGLISH IRON FOUNDERS —AND DISGUSTED WITH THEIR UNPREDICTABLE PERFORMANCE —KING HENRY VIII, EARLY IN THE 1500's, ISSUED AN ORDINANCE GOVERNING HOW GUNS SHOULD BE DESIGNED AND MADE.
THE BELL IN BOSTON'S OLD NORTH CHURCH WHICH GAVE PAUL REVERE THE SIGNAL FOR HIS FAMED REVOLUTIONARY RIDE WAS LATER RECAST BY PAUL REVERE HIMSELF.
STILL USED IN THE FASHIONING OF BRONZE ART PIECES AND DENTURES IS THE "LOST WAX PROCESS" DEVELOPED BY THE ANCIENT EGYPTIANS MORE THAN 3500 YEARS AGO.
Oil Bits
500 YEARS AGO, IT SEEMS, THE DWELLERS IN DILLENBURG CASTLE, GERMANY, WERE USING WATER PIPED THITHER BY TRUE CAST IRON PIPE.

Conference leaders included, left to right, V. J. Obrig, H. B. Voorhees, J. C. Maggart, Stephen Taylor, C. O. Schopp and R. Schumann, Jr.

Oregon Trail to Foundry Frontiers

NORMAN E. HALL / *Electric Steel Foundry Co.*

■ Pacific Northwest foundrymen who followed the Oregon trial to the sixth annual Northwest Regional Conference of the American Foundrymen's Society at Portland found themselves a part of discussions of developments on the frontiers of the castings industry.

Two hundred and thirty-three foundrymen and their wives attended the conference sponsored jointly by the British Columbia, Washington, Oregon and Oregon State College chapters at the Multnomah Hotel on October 14-15.

James T. Dorigan, Electric Steel Foundry Co., Portland, was general conference chairman, and Robert M. Burns, Pacific Chain & Mfg. Co., Portland, was program chairman. Ivan Rezucha, Electric Steel Foundry Co., handled finances for the conference.

Most of the conference's technical sessions were devoted to the AFS Casting Clinic. Clinic speakers were Hans J. Heine, AFS technical director; Clyde A. Sanders, American Colloid Co., Chicago; O. Jay Myers, Archer-Daniels-Midland Co., Minneapolis; and Harry Czyzewski, Metallurgical Engineers, Inc., Portland.

Subject of the clinic at the first technical session on Friday morning was *"Means Toward Better Castings."* The topics covered at this session were casting design, principles of gating, CO_2 process of hardening cores and molds without heat, and non-destructive testing and quality control.

The clinic speakers stated that there are three important basic concepts that are generally neglected by designers. The first of these, they stated, are to avoid abrupt changes in section thickness and to design for minimum stress concentration. Where light and heavy sections are unavoidable, proper fillets or tapered sections, or both, should be used. If blending-in of sections is not possible, fillets of fairly large radius will do. Sharp corners at adjoining sections must be avoided. The third neglected concept in design is to design with as few ribs as possible. Most ribs do more harm than good and contribute to undesirable stress concentrations, according to the clinic speakers.

R. W. deWeese, whose speech was illustrated with the board now decorating the headline.

In discussing the principles of gating, the clinic panel established 14 recommendations for the practical foundryman. These included: keep the pouring lip of the crucible low, fill the sprue quickly, don't pour directly down the sprue, put the entire gating system on the pattern, use a tapered sprue, use the smallest sprue possible to avoid misruns, and enlarge the sprue base.

The discussion of the CO_2 process called attention to the fact that CO_2 cores will absorb water. If the humidity is high, the speakers stated, water absorption to a depth of $\frac{1}{8}$ in. has been observed within 48 hours. The clinic pointed out, however, that one of the advantages of the process is the elimination of core storage and that it is economically desirable to pour as soon as possible after the cores have been made.

Non-destructive testing was described by the clinic as an invaluable, economical tool in the hands of a trained engineer or technician. The speakers stressed that non-destructive proof of the existence of a flaw or defect does not necessarily indicate the effect of the flaw or defect on the strength or ultimate serviceability of the part. Non-destructive tests must be designed and specified for reliability in each individual application. Even the well established methods of non-destructive testing, the speakers said, are subject to limitations.

Chairman for the Casting Clinic on Friday morning was H. L. Tatham, Pacific Steel Foundry.

Following a welcome from the city of Portland by Mayor Fred L. Peterson, foundrymen attending the Friday noon luncheon heard an address entitled *"Frontiers of the Foundry Industry"* by R. W. de Weese, Electric Steel Foundry Co., Portland.

Industry Frontiers

deWeese outlined some of the frontiers of the human mind—technology, research, people and education—and continued by applying these four points as challenges to the industry. He presented some of the problems which have faced the the industry, and solutions which have been developed to a point where the advanced techniques have been able to meet the competitive threat of other forms of structural materials. deWeese named ten frontiers facing the industry in the future, and indicated that the success or failure of the industry is dependent upon the success with which it is able to adopt better methods, produce better products and solve tougher problems. In closing the speaker challenged, "let us see what we can do to help ourselves advance toward the beckoning frontiers of our industry."

M. O. Woodall, Rich Mfg. Co., Portland, was chairman for the luncheon.

The Friday afternoon session of the Casting Clinic, titles *"Principles of Molding and Sand Technology,"* was presented by Heine, Sanders and Myers.

Poor Sand Cripples

The speakers stated that the best metallurgical talent in a foundry cannot offset the crippling effects

Your product is no better than the sand in your shop, as the AFS Casting Clinic session pointed out. Session chairman A. A. Belusko, left, with O. Jay Myers, Hans J. Heine and Clyde A. Sanders.

of poor sand conditions and lack of control over this important raw material. The chief function of sand control was described as a harnessing of variables to eliminate fluctuating physical properties. The result of this closely supervised preparation of sand was said to be economies in the cleaning room and the machine shop. Components and properties of molding sand and the components of core sand were described by the speakers.

Chairman of the afternoon clinic was A. A. Belusko, Electric Steel Foundry Co.

Bruce L. Simpson, national president of AFA, addressed the Friday evening banquet on the subject of *"American Foundrymen's Society and What It Means to You."*

Directing his remarks to the wives of the foundrymen, he said that membership in AFS is "job insurance." He added that they should be glad their husbands are engaged in AFS activities because such activities are constructive, masculine and profitable.

Pre-conference diners at Portland's University Club are left to right, Curtis L. Graverson, F. R. Young, Palmer Ford, Hans J. Heine, C. E. Grigsby, M. O. Woodall, Robert M. Burns, F. M. Menzel, Clyde A. Sanders, S. J. Hatchett, Arnold Sleeepr, Raymond Davies, Lloyd Fraser, James T. Dorigan, A. A. Belusko, James W .Smith, R. W. deWeese, J. S. Goehler, Harry Czyzewski, W. R. Pindell, Phillip J. Laugen.

Banquet toastmaster was James W. Smith, Holt Equipment Co.

The Casting Clinic was concluded on Saturday morning with a session called *"Scrap Diagnosis, Its Causes and Cures."* This session included ferrous and non-ferrous practice and a group discussion.

S. J. Hatchett, Canada Metal Co., Ltd., Vancouver, B.C., was chairman of the morning technical session.

The Saturday noon luncheon arranged and conducted by the Oregon State College Student Chapter featured an address by Dr. J. G. Jensen, chairman of the department of natural resources of Oregon State College.

Calvin G. Banks, chairman of the student chapter, introduced Dr. Jensen.

The conference closed with two papers on refractories presented by Palmer Ford, Kaiser Aluminum and Chemical Sales, Inc., covering *"Basic Refractories,"* and C. E. Grigsby, General Refractories, covering *"Electric Furnace Refractories."* A round table discussion followed the papers.

Conference committeemen were: James T. Dorigan, general conference chairman; Robert M. Burns, program; Norman E. Hall, publicity; W. R. Reilly, American Smelting & Refining Co., reception, registration and housing; James Smith, banquet; Frederick M. Menzel, Rich Mfg. Co., ladies activities; Gordon Frankforth, Georgia Foundry Ltd., Vancouver, British Columbia chapter liaison; F. R. Young, E. A. Wilcox Co., Washington chapter liaison; and Ivan Rezucha, finance.

Air Problem of Nitrogen Oxides in Air

■ Dr. Lauren B. Hitchcock, president of the Air Pollution Foundation has released a report stating that the scientist and engineer have made definite strides toward reducing two of three major smog components, but that work must be stepped up on the third and most difficult one, oxides of nitrogen.

"Science has not yet begun to explore the control of oxides of nitrogen, which the chemist finds in our air at any time or place," he said. "The air we breathe is about 80 per cent nitrogen and 20 per cent oxygen. Whenever we burn anything in an industrial plant, or when there is combustion of gasoline in the auto, paper in the incinerator or fuel oil in a furnace, the air going through the flame is heated sufficiently so some of the oxygen and nitrogen combine."

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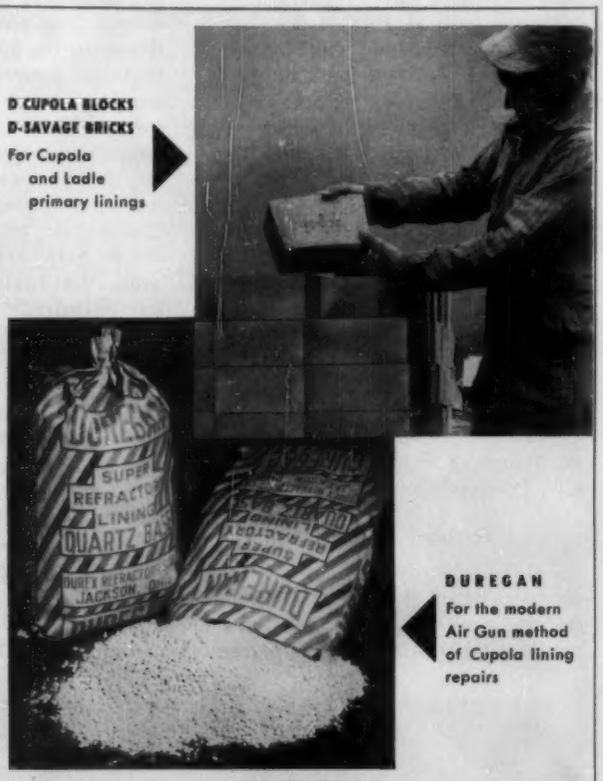

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CIRCLE NO. 141, PAGE 69-70

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CIRCLE No. 41, PAGE 69-70

Ductile Iron

28-page revised edition of "The Cast Iron That Can Be Bent" tells what ductile iron is, why it is ductile, 6 types, toughness, castability, wear resistance, pressure tightness, special properties, and applications. *International Nickel Co., Inc.*

CIRCLE No. 42, PAGE 69-70

Molybdenum

What it is, where it comes from, supply, who uses it, what it does, and strategic considerations are covered in pocket-size booklet. *Climax Molybdenum Co.*

CIRCLE No. 43, PAGE 69-70

Dye Penetrant Inspection

Bulletin says Spotcheck is easier to use, portable, requires no other equipment, and has no waste; shows applications in the plant and in the field. *Magnaflux Corp.*

CIRCLE No. 44, PAGE 69-70

Beryllium Copper Alloys

Included in 20-page "Berylco" Product Directory is the listing and description of their line of cast beryllium copper alloys. *Beryllium Corp.*

CIRCLE No. 45, PAGE 69-70

Molding Sand Data

"How to Improve Molding Sands" is a series of reports covering: bonding clays, varying contents, advantages, moldability; function of seacoal; action of sand additives; gating and feeding; measuring compressibility; U. S. molding sands; and special gray iron, malleable, non-ferrous bulletins. *Illinois Clay Products Co.*

CIRCLE No. 46, PAGE 69-70

Gamma Radiography

24-page bulletin on Kel-Ray Projectors for cobalt 60, cesium 137 and iridium 192. Covers use of atomic energy, design of projector, safety aspects, intensity and film exposure guide, suggested accessories, and AEC regulations covering use of radioisotopes. *Metal & Thermit Corp.*

CIRCLE No. 47, PAGE 69-70

Material Testing Instruments

22-sheet catalog illustrates and describes line which includes: speed indicators, tachometers, low pressure and vacuum gauge, pressure gauge tester. *Amthor Testing Instrument Co.*

CIRCLE No. 48, PAGE 69-70

Wire Rope Slings

17 x 21-in., three-color, wall chart for Acco-Registered wire rope slings, lists diameters and lifting capacities of Strand-Laid-type slings. *American Chain & Cable Co., Inc.*

CIRCLE No. 49, PAGE 69-70

Industrial Ventilation

B and E Ventura Fans are featured in Bulletin 7214 which discusses V-belt drive, electrical requirements, delivery at different static pressures, fan speed, horsepower; includes tables of performance data. *American Blower Corp.*

CIRCLE No. 94, PAGE 69-70

High Vacuum Melting

First semi-continuous, high-vacuum melting and casting furnace marks the solution to many problems which have bottlenecked progress. 1,000 lb. crucible melts charge after charge without breaking vacuum, gives a monthly yield of 120,000 lb. of high-purity metal. Installation illustrated. *Consolidated Vacuum Corp.*

CIRCLE No. 50, PAGE 69-70

Flame Hardening

8-page reprint of results of tests on types of cast iron to help choose the right combination for a given application. *Meehanite Metal Corp.*

CIRCLE No. 51, PAGE 69-70

Gunning Refractory

Booklet G-102, "Gunning Practices and the BRI Gun," discusses history, development, and current gunning procedures in the foundry as well as other applications; outlines advantages of air-emplacement. *Basic Refractories, Inc.*

CIRCLE No. 52, PAGE 69-70

Non-Ferrous Melting Refractories

Bulletin offers recommendations for the use of Super Refractories in twelve types of non-ferrous melting furnaces. Advantages are given. *Carborundum Co.*

CIRCLE No. 53, PAGE 69-70

Metals & Alloys

Description, general specifications, and uses of aluminum master alloys of titanium, titanium-boron, boron, and zirconium, together with special suggestions are included in series of technical data sheets and product list. *Kawecki Chemical Co.*

CIRCLE No. 54, PAGE 69-70

Iron Foundry Alloys

Brochure lists composition and recommended uses of principal Vancoram alloys for iron foundries. VCA's iron foundry technical service facilities are discussed. *Vanadium Corporation of America*

CIRCLE No. 55, PAGE 69-70

Work Holding Tools

Catalog 9155 describes line of work holding tools including vises for angle machining, adjustable lathe fixtures, and safety work holders for drill presses. *Universal Vise & Tool Co.*

CIRCLE No. 56, PAGE 69-70

Gamma Projectors

For rapid, low-cost industrial radiography for on-the-job or in-position inspection of heavy castings. Description and prices. *Budd Co.*

CIRCLE No. 57, PAGE 69-70

Aluminum Casting Alloys

Data sheet gives specifications, properties, and characteristics of standard aluminum casting alloys used for general engineering purposes throughout the United Kingdom. *ALAR, A Technical Association of Light Alloy Refiners, London.*

CIRCLE No. 58, PAGE 69-70

Infra Red Heating

Ceramic lampholders that withstand 2500F are described in bulletin that recommends their use in shell molding, and heat treating. Quartz lamps have estimated average life of 5000 hr. Design help, conveyors and infra-red appliances and ovens discussed. *Miskella Infra-Red Co.*

CIRCLE No. 59, PAGE 69-70

Control of Boron Steels

New spectrochemical excitation unit is key to essential control in boron steels where it is necessary to accurately analyze trace amounts of the element. Bulletin. *National Spectrographic Laboratories Inc.*

CIRCLE No. 60, PAGE 69-70

Titanium & Zirconium Products

Chemical analyses and physical properties and applications of Tam titanium and zirconium products including metallurgical alloys and foundry products. *Titanium Alloy Mfg. Div., National Lead Co.*

CIRCLE No. 61, PAGE 69-70

Testing Machine Progress

28-page special 75th anniversary issue of "Tinius Talks" traces the development of testing machines. 60,000 lb De Luxe Super "L" shows versatility of the modern universal testing machine to a wide range of tesitng needs. *Tinius Olsen Testing Machine Co.*

CIRCLE No. 62, PAGE 69-70

Malleable Iron

Issue 52 of Malleable Iron Facts deals with comrpessive strength of malleable iron, malleable parts on ovehead doors, and expansion joins for concrete highways. *Malleable Founders' Society.*

CIRCLE No. 63, PAGE 69-70

Special Cleaning Problems

34-page Catalog 724 describes application of specially designed airless blast equipment to 56 production cleaning problems involving size and weight capacity above that of a standard ma-

Steel Founders' Hold Tenth Tech Talks

■The tenth anniversary Technical and Operating Conference of the Steel Founders' Society of America was held at the Carter Hotel in Cleveland November 16-18. 561 men from the industry and their guests took part in the three-day program.

Robert C. Wood, Minneapolis Electric Steel Castings Co., chairman of the Technical and Operating Committee, keynoted the conference with the statement that "the advanced steel casting technology being presented at this meeting did not exist ten years ago and thus represents the degree of progress which has been made in the industry."

Lee C. Wilson, honorary member of the society, was honored at a luncheon as the first technical and operating chairman of the society. In his remarks he called attention to the visions and hopes which the early committees held for the conference which have been achieved in recent years.

Tributes to technical and operating activities of SFSA came from R. C. Wood, left, conference chairman; Charles W. Briggs, SFSA technical and research director; and Lee C. Wilson, honorary member of the society and chairman of the first SFSA technical and operating conference.

Committee members: left to right, front row, Robert Bedford, American Cast Iron Pipe Co.; R. C. Wood, Minneapolis Electric Steel Castings Co., chairman; E. B. Nutter, Alloy Steel & Metals Co. Back row, H. E. Gebhart, Continental Foundry Machine Co.; F. B. Barclay Jr. and A. T. Bird, both General Steel Castings Corp.; W. J. Steward, Dominion Foundries & Steel Ltd.; and A. M. Herrmann, Racine Steel Castings Co.

A. J. McDonald, SFSA president, reviewed some of the society activities in his luncheon remarks.

Technical developments revealed during the conference's technical sessions included the disclosure that cold setting binders are being used for cores up to 700 lb. It was also stated that some steel foundries are using the CO_2 process for as much as 25 per cent of their core requirements.

Further technical discussions indicated the increased use of plastics in patternmaking, the attention being given pH control of foundry sands, and concern over problems arising from inspection methods.

Discussion of inspection methods included the safety precautions in the use of cobalt in strengths of around 10 curies and the pressure testing of steel cast values on a production line basis. The use of dye penetrants and magnetic particle inspection for high volume production was also discussed.

chine, special work-handling mechanisms, and cleaning speeds geared to high production schedules. *Wheelabrator Corp.*

CIRCLE No. 64, PAGE 69-70

Sand Screen

Bulletin 525 provides specifications and description of the Screenmaster, new, self-contained screening and separating unit. Details of radial-type magnetic pulley and controlled vibration and feed rate. *National Engineering Co.*

CIRCLE No. 65, PAGE 69-70

Foundry Equipment

72 pages of layouts, installation photographs, and schematic diagrams of the Jeffery line are contained in Catalog 845. Included are aerators, briquetting systems, elevators and conveyors, sand, mold, and casting handling equipment, crushers, feeders; flaskfillers, sand reclamation and preparation systems and almost every other piece of foundry equipment. *Jeffrey Mfg. Co.*

CIRCLE No. 66, PAGE 69-70

Graphitic Core Coating

Technical Bulletin FPG-128 says Graph-Kote should be used wherever a "short" wash is desired. Cores are dipped faster, have no run-downs, or build up; conveyors and ovens are cleaner; minimum cleaning of cores. *Frederic B. Stevens, Inc.*

CIRCLE No. 67, PAGE 69-70

Plastic Fire Brick

Bulletin says exclusive blending, grain sizing, and moisture control with 100% Missouri clays assures ultimate in ease of application and brings out best characteristics of each grade for maximum service life. *Walsh Refractories Corp.*

CIRCLE No. 68, PAGE 69-70

Pyrometers

Catalog 175 of Pyro instruments for precision temperature measurement includes optical, micro-optical, radiation, immersion, surface, and indicating pyrometers. *Pyrometer Instrument Co., Inc.*

CIRCLE No. 69, PAGE 69-70

Phenolic Resins

12-page CDC-224 describes G-E 12353 water-dilutable core binder, designed to increase production, shorten baking cycles, reduce costs, and improve quality. Lists green and baked properties, typical core mixes, spraying, storing,

and handling precautions, samples and ordering information. *Chemical Div., General Electric.*

CIRCLE No. 70, PAGE 69-70

Material Handling Techniques

24-page issue of *"Material Handling News"* shows studies of handling techniques involving unusual uses of fork trucks and descriptions of new equipment. 50 photographs illustrate case histories of cost-saving methods. *Industrial Truck Div., Clark Equipment Co.*

CIRCLE No. 71, PAGE 69-70

Refractory Products

32-page catalog covers the entire line of Plibrico refractory products for the industrial furnace field, describes and illustrates typical applications. *Plibrico Co.*

CIRCLE No. 72, PAGE 69-70

Foundry Ovens

24-page Bulletin 54 describes, shows specifications and some floor layouts for portable, rolling drawer, transrack, tower, horizontal conveyor, conveyor redry, dielectric, and car-type core ovens; high-speed and portable mold ovens; plaster mold and special purpose ovens; heat treat ovens; McCann furnaces; recirculating heating systems and auxiliary equipment. *Foundry Equipment Co.*

CIRCLE No. 73, PAGE 69-70

Positive Displacement Bins

Bulletin shows how PneuBin prevents arching and funneling of materials with pulsating panels mounted in the zone of trouble. They are quiet, avoid battering the bin, easy to install, operate economicaly, dependable, and eliminate poking down material from above. *Gerotor May Corp.*

CIRCLE No. 74, PAGE 69-70

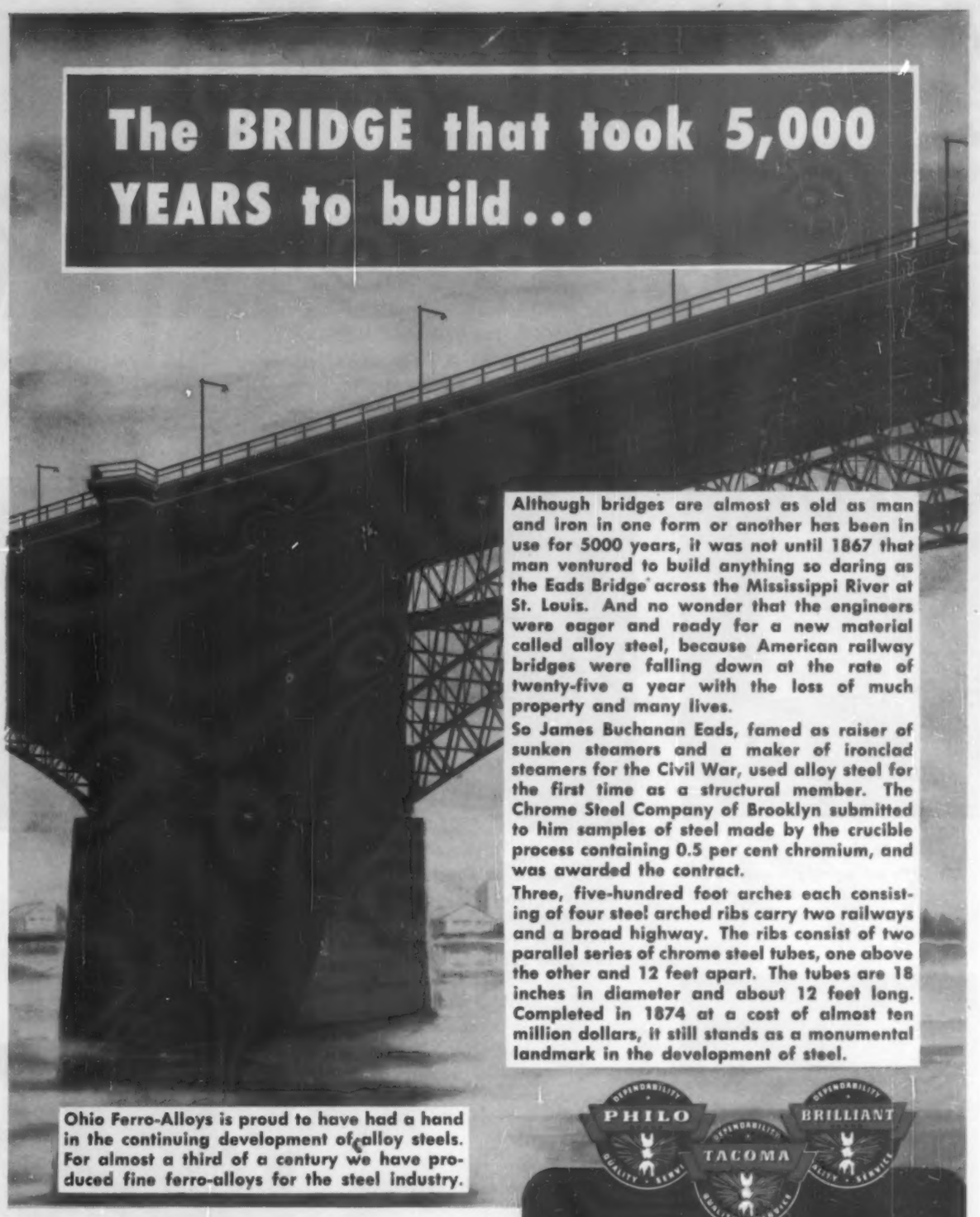
Aluminum Melting

"How to Melt and Cast Aluminum Alloys" covers: proper pouring temperatures; how to—minimize drossing, de-gas, avoid air entrapment; gating & risering to eliminate cracking; use of holding kettles, and types of furnaces to use (and not to use). *George Sall Metals Co.*

CIRCLE No. 75, PAGE 69-70

CO_2 Binder and Sands

6-page DonCo_2 bulletin describes washes and pastes as well as binder and sands for cores and molds by the Carbon Dioxide Process. Topics include:


The BRIDGE that took 5,000 YEARS to build...
Although bridges are almost as old as man and iron in one form or another has been in use for 5000 years, it was not until 1867 that man ventured to build anything so daring as the Eads Bridge across the Mississippi River at St. Louis. And no wonder that the engineers were eager and ready for a new material called alloy steel, because American railway bridges were falling down at the rate of twenty-five a year with the loss of much property and many lives.
So James Buchanan Eads, famed as raiser of sunken steamers and a maker of ironclad steamers for the Civil War, used alloy steel for the first time as a structural member. The Chrome Steel Company of Brooklyn submitted to him samples of steel made by the crucible process containing 0.5 per cent chromium, and was awarded the contract.
Three, five-hundred foot arches each consisting of four steel arched ribs carry two railways and a broad highway. The ribs consist of two parallel series of chrome steel tubes, one above the other and 12 feet apart. The tubes are 18 inches in diameter and about 12 feet long. Completed in 1874 at a cost of almost ten million dollars, it still stands as a monumental landmark in the development of steel.
Ohio Ferro-Alloys is proud to have had a hand in the continuing development of alloy steels. For almost a third of a century we have produced fine ferro-alloys for the steel industry.
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Minneapolis Birmingham San Francisco Los Angeles

Photo Story of GIFS Annual Meet

1956 GIFS officers are President C. H. Ker left, Treasurer W. O. Larson, Vice-President J. Scott Parrish Jr.; C. H. Meminger, secretary, is missing from the photo. Ker, Larson and Meminger were re-elected.

Earl H. Thompson, right, head of GIFS advertising committee, receives citation for service from award chairman Seelbach.

1955 board of directors, left to right standing, G. L. Nimocks, J. W. Simmons, Jr., C. S. Wieland, A. M. Nutter, W. S. Brunk, E. T. White, E. M. Knapp, A. H. Renfrow. Seated are, R. T. Lewis; GIFS president; W. E. Illig; and W. O. Larson, GIFS treasurer. Executive Secretary D. H. Workman; H. J. Trenkamp, C. H. Ker, GIFS

Another citation goes to Earl Paltenghi for his leadership of organization's activities in California and in the FEF.

Earl's award, and other activities pictured, were described in the December issue of MODERN CASTINGS.

First prize in 1955 Redesign Contest was presented to B. W. Johnson of Aquamatic, Inc., Rockford, Ill. manufacturer of pumps and water softeners.

history, sand mixing, storage life, pattern equipment, hardening, residual moisture and gas, collapsibility, and cost. *Brumley-Donaldson Co.*

CIRCLE NO. 76, PAGE 69-70

Overhead Materials Handling

12-page booklet describes and illustrates track switches, carriers, tractors, cranes, automatic handling systems, interlocks, electrification, buckets and grabs. Stresses in overhead track are analyzed, track peening is covered. *Cleveland Tramrail Div., Cleveland Crane & Engineering Co.*

CIRCLE NO. 77, PAGE 69-70

Refractory Specialties

20-page Ramtite catalog illustrates and describes materials and methods for installing plastic and castable refractories, cements, and mortars in ladles, crucible and reverberatory furnaces, subject to temperatures to 3200 F. *Ramtite Div., S. Obermayer Co.*

CIRCLE NO. 78, PAGE 69-70

Production Scrap

News Letter No. 39 describes the mechanized molder's dependence on sand conditioning and maintenance. (co-partners in the production team). Sand must not be blamed for scrap when defects are the result of poor gating and cold iron. *American Colloid Co.*

CIRCLE NO. 79, PAGE 69-70

"Impossible" Steel Casting

Product Design Study 71 tells and shows how an "impossible" pressure casting for natural gas pumping station was produced in cast steel. *Steel Founders' Society of America*

CIRCLE NO. 80, PAGE 69-70

Grinding Wheels

32-page Catalog 5E, covers line of grinding wheels including, general purpose, cut-off, snagging; mounted wheels, shapes, and points; and abrasive sticks and bricks. *Peninsular Grinding Wheel Div., Abrasive & Metal Products Co.*

CIRCLE NO. 81, PAGE 69-70

Hard Surfacing Alloys

New line of materials consisting of alloy-filled tubes, either in coils for automatic welding, or cut to length for manual application are described in bulletins. *Coast Metals, Inc.*

CIRCLE NO. 82, PAGE 69-70

continued on page 79

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Canada—Canadian Foundry Supplies & Equipment, Ltd.
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NATIONAL BENTONITE helped manufacture this Caterpillar® giant!

This Caterpillar® DW21 Tractor and Scraper — shown stripping blow sand overburden from a deposit of bentonite — had many of their important parts cast in molds bonded with this same mineral. Castings for such heavy equipment must obviously be cast sound without any defects. That's why scores of good foundrymen the nation over specify National Bentonite to bond their molds. It's mined from the purest deposits of bentonite in the world . . . provides greater mold permeability, higher tensile strength, good green strength, higher hot strength, higher sintering point, and many other advantages.

Whatever the metal you're pouring — malleable iron, gray iron, steel, brass, aluminum, or magnesium — National Bentonite used as a bonding agent in your sand will produce finer, smoother castings and cut your reject loss. There are scores of good reasons why you should specify National Bentonite. Write today for folder and technical specifications.

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CIRCLE NO. 143, PAGE 69-70

Ted Operhall (right) receives past president's plaque from incoming ICI head V. S. Lazzara

INVESTMENT CASTERS Evaluate New Processes

HERBERT F. SCOBIE/*Editor*

Investment Casting Institute officers and directors for 1955-56 are, left to right, R. S. Banister, Midwest Foundry Co.; W. A. Dubovick, Engineering Precision Casting Co.; K. W. Thompson, K. W. Thompson Tool Co.; Harry Dolan, executive director; President V. S. Lazzara, Casting Engineers, Inc.; Past President Ted Operhall, Misco Precision Casting Co.; P. W. Schipper, Howard Foundry; A. C. Williams, Crucible Steel Co.; R. Miller, Precision Metalsmiths; and W. L. Worthen, Bone Engineering Co.

■ New casting techniques, specifications, testing of process materials, and use of investment castings in automotive and aircraft engines highlighted discussions at the annual meeting of the Investment Casting Institute, November 1-3 in Detroit.

ICI President Ted Operhall, Misco Precision Casting Co., who presided, was succeeded by V. S. Lazzara, Casting Engineers, Inc. Incoming vice-president is R. S. Banister, Midwest Foundry Co. New board members are Mr. Operhall, P. W. Schipper, Howard Foundry Co., W. L. Worthen, Bone Engineering Co., and Robert R. Miller, Precision Metalsmiths, Inc. Harry Dolan continues as executive director.

Discussion of new casting processes was led by Dr. Nicholas J. Grant, Massachusetts Institute of Technology, ICI technical consultant. He described techniques which, he said, needed broader industrial trials for proper evaluation. A process using a slip of finely divided, low-expansion glass eliminates the pre-coat, failure of which causes more defective castings than any other factor in investment work. (EDITOR'S NOTE: See *"They're Making Molds Out of Glass Now,"* pp. 30-32, MODERN CASTINGS, August 1955.)

A second process depends on trichlorethylene vapor for removal of the wax pattern. Relatively low, uniform temperature avoids cracking of the pre-coat. Other advantages listed by Grant include less floor space required, larger castings can be made, and the mold is more porous. Cored castings are more difficult to make by this process.

A process in which the mold material gels and is stripped from the pattern while elastic permits use of patterns with undercuts and backcraft. The process has found its greatest use in England where it is often used in development work, then the job is transferred to standard lost wax procedures for production. (EDITOR'S NOTE: Process details are in *"Investment Precision Casting Without Expendable Patterns,"* pp. 64-69, AMERICAN FOUNDRYMAN, June 1954.)

Metal specifications aid in making better castings, and define a company's product, Roger Waindle, Wai-Met Engineering Co., said in announcing specs release by the Metal Specifications Committee. He recommended that as-cast chemistry be determined as frequently as necessary to establish and maintain quality.

E. G. Chapman, Misco Precision Casting Co., reporting for the Dimensional Tolerances Committee, said a design in preparation would show manufacturers what they can reasonably expect of investment castings, and will avoid both underselling and overselling.

An ICI standard test bar is being developed by the Physical & Non-Destructive Testing Committee, according to B. W. Duncan, Misco Precision Casting Co. The Process Materials Standards Committee is setting up purchasing and acceptance standards for non-metallic materials, W. A. Dobovick, Engineered Precision Casting Co., reported.

Growth of the investment casting industry has paralleled advances in gas turbines, Dean K. Hanink, Aircraft Engine Operations, Allison Div., General Motors Corp., said in presenting his paper. Investment castings are largely confined to blades and vanes but may play a role in the form of larger components in the future. More stress on quality control is needed to show that castings can do better than present acceptance standards.

In discussing investment castings for automotive gas turbines, Dr. Donald N. Frey, Scientific Laboratory, Ford Motor Co., said his company will trade lower quality leading and trailing edges for low cost blades, with automatic finishing to improve edges.

Relating solidification patterns to casting quality, Dr. R. A. Flinn, University of Michigan, suggested that investment casters quantitatively apply available knowledge of fluidity, shrinkage, and gas evolution to their practice. Know your liquidus and pouring temperature, he said, then use the same degree of superheat when using another alloy in the same mold. Risering and feeding distance information can be developed for investment casting alloys and section sizes. More attention needs to be paid to effect of melting stock and furnace lining on dissolved gas, and to the benefits of simple vacuum melting and pouring.

The European investment casting industry was described in a paper by Walter Sulzer, Sulzer Brothers, Winterthur, Switzerland, read by George Cannon, Jr. There are 46 precision foundries in Europe and all except those in England have had to rely on markets outside the aircraft industry. Trend in binders is away from ethyl silicate to the cheaper water-soluble binders such as phosphoric acid or cement.

Seven AFS Chapters Center on Syracuse

VERN CARLSON / *Technical Writer*

■ Members of seven American Foundrymen's Society chapters met at the Hotel Onondaga, Syracuse, N. Y. November 18-19 for the New York State-Canada-Pennsylvania Regional Foundry Conference. Participating chapters were: Eastern New York, Central New York, Western New York, Rochester, Eastern Canada, Ontario, and Northwestern Pennsylvania.

Heading conference arrangements was General Chairman Edgar G. White, Crouse-Hinds Co., Syracuse. James O. Ochsner, also of Crouse-Hinds, was chairman of the Program Committee.

At the Friday opening general session John E. Gotheridge, Foundry Services Inc., Columbus, Ohio, speaking on *"Carbon Dioxide Process"* warned that any moisture in

Edgar G. White

the sand will make cores decrease in strength upon standing. Because the core will harden upon standing it is preferable to under-gas rather than over-gas; the latter produces a friable surface and the core will loose strength upon standing.

The carbon dioxide process of hardening molds was demonstrated through the courtesy of Oberdorfer Foundries, Inc., Syracuse, which also furnished session co-chairmen Wm. A. Mader and David Brown.

Meeting in simultaneous afternoon sessions were pattern, gray iron, non-ferrous, then sand, quality, and technical paper contest groups.

The pattern panel speakers were all local men, including: Kenneth Digney, Oberdorfer, who spoke on *"Pattern Requirements for Production Foundries;"* Guy A. Pealer, General Electric Co., Elmira, on *"Coordinating Design and Use of Patterns;"* and Louis V. Burns, Carrier Corp., Syracuse, on *"Purchasing Patterns."* Session co-chairmen were Harold R. Brakeman, City Pattern Shop, Inc., Syracuse, and William C. H. Dunn, Western Pattern Works, Montreal.

Digney set the timetable of foundry production progress as hand work until World War I when power molding was first considered practical, and until World War II when it became necessary. Aircraft demands particularly high strength-weight ratios, lightness, accuracy, complexity. Digney said the patternmaker doesn't have much trouble selling foundrymen on the best equipment for new castings even though the costs may be high.

According to Pealer a well-designed, well-made pattern will result when the pattern engineer is a trained patternmaker with molding and coremaking experiencee. Pealer compared the pattern shop foundry relationship to that of the tool room and the machine shop.

We can get almost anything we want at a price, observed Burns, who explained that before specifying pattern equipment, he forecasts pattern usage in number of pieces to be cast per year; then he considers the use of the casting to determine pouring position and type of molding to secure pressure tightness, dimensional tolerance, smoothness, wear resistance, etc. Cost-conscious Burns specifies finish on machined surfaces to insure that castings will be at a minimum weight with minimum machining time.

Charles F. Walton, Gray Iron Founders' Society, Cleveland, spoke to the gray iron session on *"Risering Gray Iron."* He said that there was a time when risering practice for gray iron was considered to be unlike that for other metals; but with today's breadth of gray iron alloys it is necessary for a successful operator to be cognizant of all basic feeding and risering fundamentals.

Co-chairmen of the session were Erwin Deutchlander, Worthington Corp., Buffalo, and J. Thomas Coggin, General Eelectric, Elmira.

Speaker William A. Mader, left, and part of his audience take a look at some of the insulated risers he recommends for use with aluminum alloys.

The non-ferrous group heard two men from the Federated Metals Div., American Smelting & Refining Co., Robert A. Colton and D. L. LaVelle, speak on *"Gating and Risering Brass and Aluminum Alloys."*

They said local overheating of any portion of the mold or core by the molten stream should be avoided by careful distribution of liquid metal. Multiple gates minimize many problems of running excess metal through a single gate. Bottom gating usually does not solve as many problems as it creates because of the distributed solidification pattern. Best experimental data shows that step gating does not work. They recommended the drag-runner, cope-ingate system for controlling metal flow.

Lloyd D. Wright

Session co-chairmen were Curtis M. Fletcher, Fairbanks Co., Binghamton, N. Y., and E. J. Baker, Federated Metals Div., Rochester.

Survey fundamental, technical, and practical information of other fields using granular aggregates—taconite ore, refractories, and ceramics, suggested Clifford E. Wenninger, National Engineering Co., Chicago, at the sand session in his talk *"Digging into Sand Fundamentals."*

Packing grains to maximum density depends upon particle size, shape, distribution.

Wenninger recommended excessive clay for synthetic sands with strength controlled by mulling time. Additives that absorb water, he continued, require sufficient time for absorption. Wenninger admitted that sand testing may not predict performance of sand, but emphasized its necessity for dupli-

cation of good results day after day.

Presiding were Donald E. Webster, American Laundry Machinery Co., Rochester, and Joseph Otvos, Straight Line Foundry & Machine Co., Syracuse.

There's been a tremendous change in the responsibility for scrap in this era of mechanization, noted Barney C. Yearley, National Malleable and Steel Castings Co., Cleveland, in his talk *"Casting Defects"* before the quality session. He said today's molders are machine operators and that casting know-how must come from supervision who must keep up with recent technological developments to stay in business. Yearley stated logical casting users are forced to use more costly materials because, although a satisfactory casting may be produced, they don't know when the periods of bad castings will occur.

Session chairmen were Carl W. Weber, Frazer & Jones Co., division of Eastern Malleable Iron Co., Syracuse, and Harold R. Kohl, GE, Elmira.

Winning papers of Ontario Chapter's Technical Papers Contest were presented in a separate session. First prize winner John R. Morgan, Foundry Services Ltd., Guelph, Ont., presented *"The Cause and Prevention of Gas Porosity and Non-Metallic Inclusions in Aluminum Alloys."* Second prize paper, *"Gating and Risering of Non-Ferrous Alloys,"* by Alan R. Moore, was presented by William H. L. Bryce, International Harvester Co. of Canada Ltd., Hamilton, Ont., co-chairman of the session. Other co-chairmen were Franklin W. Kellam, Electro Metallurgical Co. of Canada, Welland, Ont., and R. W. Cologgi, Goulds Pumps, Inc., Seneca Falls, N. Y.

Morgan said that in gating and risering, the laws of shrinkage, along with the laws of hydrostatics are forgotten and even imagination is often unexercised. But the most common fault is complete ignorance of elementary crystallography. Morgan declared no foundryman is competent without a sound knowledge of basic elements of these phases of science.

Never pour this easy, and that hard, advised Morgan; let the runner and ingate determine the pouring speed, but keep the pouring basin full at all times. With molding sand and gating correct and constant, with full pouring basins the only variable is metal condition which may vary with the casting but must not vary through negligence.

Moore writes that as the gas content of an aluminum heat is lowered, the partial pressure of its hydrogen content in equilibrium with the melt is also lowered and each bubble of scavenger gas removes less and less hydrogen from the metal. According to Moore, this partial pressure theory explains why degassing treatments are more efficient at low temperatures when the partial pressure of hydrogen is higher and each bubble of scavenger can remove relatively large amounts of hydrogen.

Conference Chairman White, presided at the banquet; L. D. Wright, National—U. S. Radiator Corp., Geneva, N. Y. was toastmaster.

AFS President Bruce L. Simpson, National Engineering Co., Chicago, declared that the success of the technical society of the casting industry, American Foundrymen's Society, results from groups of foundrymen with an inborn desire to do something besides their work and to be of service to others.

Wm. W. Maloney, general manager of AFS, discussed preparations for the coming 60th Annual AFS Casting Congress at Atlantic City May 3-9, 1956, and invited all to attend.

Leonard Greenfield, Samuel Greenfield Co., Inc., Buffalo, introduced fellow Buffalo citizen William Moss, vice-president, Cling Surface Co., who spoke on *"Life in Foreign Lands."*

Simultaneous sessions of gray iron, non-ferrous, sand, and malleable groups were held Saturday.

"Modern Gray Iron Cupola Practice" according to T. H. Burke, Worthington Corp., Buffalo, includes preparation of cupola blast. At 8000 cfm air with 6 grains of moisture/cu ft delivers nearly 50 gal/hr of water to the cupola observed Burke. This increases oxidation of silicon, manganese, carbon, and iron and lowers melting rate and temperature and increases metal chill and scrapped castings.

Victor Rowell, center, presenting his paper at sand session with the chairmen of the session, John J. Bryant, left, and Bailey Herrington.

Continuing, Burke said preheating the blast to 400-500 F saves coke, reduces bridging, raises combustion efficiency, lowers oxidation losses producing hotter iron of more uniform composition, and also lowers refractory consumption.

Co-chairmen for Burke were Milton D. Emery, Buffalo Pipe & Foundry Corp., Buffalo, and Edward H. Fiesinger, Sr., Crouse-Hinds, Syracuse.

Speaking to the non-ferrous session on *"Application of Insulated Risers to the production of Aluminum Alloy Castings,"* William A. Mader, Oberdorfer, explained that exothermic mixtures for sleeves, pads, and knock-off cores contain aluminum chips, an oxidizing agent, a triggering agent, a filler to control the reaction, and a binding agent to make the mixture moldable. Mixed with water in a sand muller, it is rammed in a suitable core box, drawn, and baked at 400 F for about two hours. Mader warned that the mixture may ignite prematurely if this temperature is exceeded. He recommended thorough venting of the green core to release gas formed by the exothermic reaction.

Co-chairmen of the non-ferrous session were Lawrence R. Barnhart Thomas Foundry, Inc., Syracuse, and Robert P. Watson, Chicago Pneumatic Tool Co., Utica.

At the sand session, in his talk on *"Elevated Temperature Properties of Molding Sands,"* Victor Rowell, Harry W. Dietert Co., Detroit, said the rather violent expansion of silica sand grains at around 1200 F. cannot be prevented, but it can be controlled with the clay which is becoming dehydrated at this temperature and is shrinking, and by the burning out of organic materials. More important, he continued, the mold surface can deform and absorb some of the expansion. Rowell recommended high percentages of clay, low moisture content, and cellulose additives to enhance hot deformation.

Co-chairmen were Bailey D. Herrington, Hickman, Williams & Co., Erie, Pa., and John J. Bryant, George W. Bryant Core Sands, Inc., McConnellsville, N. Y.

A 100 per cent increase in production of pearlitic malleable for 1955 over 1954 was anticipated by Gordon B. Mannweiler, Eastern Malleable Iron Co., Naugatuck, Conn. Speaking at the malleable session on *"Production of Pearlitic Malleable Iron"* Mannweiler, said the tremendous potential market for pearlitic awaits knowledge of what the material can do, improvements in processing methods, aggressive selling. He then discussed the effects of every ladle addition used in pearlitic processes, heat treat and quality controls.

Presiding at the malleable session were Russell C. Sawyer, Frazer & Jones, Syracuse, and Donald J. Merwin, Oriskany Malleable Iron Co., Oriskany, N. Y.

continued on page 93

continued from page 74

Core & Mold Ovens

16-page Bulletin 53-CM contains schematic diagrams, illustrations, description and specifications of rack, car, vertical, horizontal monorail, rolling drawer, portable and special ovens; ingot mold dryers; and heat treating furnaces. *Carl-Mayer Corp.*

CIRCLE No. 83, PAGE 69-70

3 to 15 Ton Cranes

8-page catalog 86 tells why the "E" type overhead traveling crane is particularly valuable where cranes are used intermittently or where high-speed lifting and travel are not essential. *Whiting Corp.*

CIRCLE No. 84, PAGE 69-70

Int'l. Foundry Trades' Fair

Dusseldorf, Germany, will be the site of the 1956 International Foundry Congress as well as the International Foundry Trades' Fair, September 1-9. 24-page brochure in German, French, and English describes this unique opportunity to survey international foundry equipment; lists exhibits and gives conditions for exhibiting. *German American Trade Promotion Office.*

CIRCLE No. 85, PAGE 69-70

Dust Collector

99% efficient Wheelabrator Dustube cloth-tube-type collector traps discharge gases from electric furnaces. Four case histories, a discussion of cfm requirements, and of the synthetic filtration fabrics employed are included in Bulletin 553-D. *American Wheelabrator & Equipment Corp.*

CIRCLE No. 86, PAGE 69-70

Casting Sealer

Permafil 3255 for sealing porous metal castings is said to give one shot impregnation, permanent tight seal, resist solvents, have low flamability and volatility, low cost, and meet MIL-1-6869A. Mailing piece CDC-240, Product Data Sheet and Application Bulletin are available. *General Electric Co., Chemical Div.*

CIRCLE No. 87, PAGE 69-70

Better Castings

"The Significance of Brinell Tests in Gray Iron" is a 12 page discussion of the application of hardness testing by

continued on page 94

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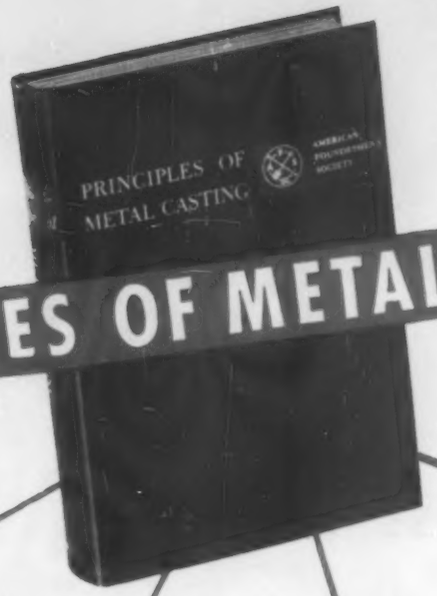

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A sound text for a study of the technical aspects of the American foundry industry and an excellent reference manual.

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Every metallurgist, designing engineer, and shop library should possess this book. It not only mentions practically everything in the casting process, but gives references to further information on any subject.

COVERS . . . molding processes including the sand casting methods, shell molding, die and permanent mold casting, investment, etc. Mold materials and construction, molding equipment, solidification of metals, gating and feeding of castings, molding sand technology, cleaning of castings, castings design, metallurgical principles associated with melting, composition of casting alloys and their properties, heat treatment, and metallurgical processing characteristics of foundry practices. No processes other than metal casting are considered.

Principles associated with molding processes and materials and solidification of metals are presented in the first eleven chapters; the principles are then interpreted for the specific casting alloys (fourteen chapters). Special metallurgical principles of melting, alloying, heat treating, and metallurgical processing are confined to portions of the latter fourteen chapters.

Prepared by Richard W. Heine and Philip C. Rosenthal of the University of Wisconsin, Madison, Wisconsin.

CASE BOUND

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Speakers and officers held breakfast meeting prior to Michigan Regional.

Study Process Variables At Michigan Regional

HERBERT F. SCOBIE / *Editor*

■ Control of operating variables in old and new processes was featured at the Michigan Regional Foundry Conference December 1 and 2. Attended by over 300 foundrymen, the conference was staged at Michigan State University under the sponsorship of the Detroit, Central Michigan, Saginaw Valley, and Western Michigan Chapters of the American Foundrymen's Society, along with the student chapters of MSU and University of Michigan, and the Continuing Education Service of MSU. All meetings were held at the university's Kellogg Center.

Engineering students interested in careers in the castings industry participated throughout the conference with one session devoted to a prize winning contest paper on investment casting and an AFS student chapter member acting as vice-chairman of each sesion.

Conference chairman was John A. Van Haver, Sealed Power Corp. The program was developed under the chairmanship of Fred P. Strieter, Dow Chemical Co.

Opening the conference, Prof. L. L. Otto, MSU, pointed out the need for constantly re-evaluating products and processes if an industry is to maintain and advance its standing among manufacturers. Conference Chairman Van Haver presided at the opening session.

Morale is the key to productivity, John W. Schneider, Dearborn Iron Foundry, Ford Motor Co., said in the keynote address. Since the foreman is the key to morale, company policies must be properly administered by the foreman and he must be kept informed by management.

As personnel relations bccome second hand, morale problems multiply, Schneider warned. Good foremanship requires good foreman training, he stated. It is not something that men inherently have.

First technical speaker was Hans J. Heine, AFS technical director, who discussed the CO_2 process for hardening molds and cores. It is not a panacea, he said. It is another process to add to the manufacturing methods already available to foundrymen.

An investigation of CO_2 process process methods in actual use in foundries has been undertaken by the Core Test Committee, Heine said, and a full report will be presented during the AFS Castings Congress, May 3-9, in Atlantic City.

Session chairnan was Harry E. Gravlin, Jr., Claude B. Schneible Co., Vice-chairman was Jack Lane, chairman of the MSU Student Chapter.

Luncheon speaker was Dr. W. W. Whitehouse, president of Albion College. He urged his listeners to have confidence in their ability to push back frontiers, to undertake risks successfully, and to maintain an atmosphere of growth, competition, and free enterprise.

Dr. Whitehouse was introduced by Collins L. Carter, Albion Malleable Iron Co. Gardner R. Lloyd, Albion Malleable, presided.

Two panel sessions rounded out the day's technical activities. The first, a casting defect clinic, had Harry Gravlin as moderator and the following panel members: R. W. Gardner, Ford Motor Co., E. J. Passman, Frederic B. Stevens, Inc., Michael Warchol, Atlas Foundry Co., Prof. R. A. Flinn, University of Michigan, and H. LaForet, Pontiac Foundry, General Motors Corp.

Gardner said an organized, positive approach to quality control was essential to finding defects in your own rather than in the customer's plant. Standards needed to give zero scrap can be developed, he stated. They are not something you pick up in another plant or pull out of a hat. He described the use of "moving average" to overcome apparent wide variations in quality due to irregularities in reporting, cleaning, machining, etc. The moving average is based on figures for several days or weeks with values for the first day of the period dropped each day as figures for the new day are included in the average.

Dr. Flinn reviewed gas defects due to mold and metal conditions. Determine whether a gas defect is due to mechanical (mold) or chemical (metal) conditions, he said, and if it's the latter, correct it like you would any off-analysis metal. Mold factors localize the gas defect, he asserted, and listed as possible causes: chill in the cope, thin section, heavy core wash or wet mold, aspiration in the sprue (failure to follow AFS gating recommendations), and drops, crushes, and spalls.

John Schneider: Never coast —you'll be going downhill.

Commenting on sand-caused defects, Passman warned that sand properties can be varied readily but that changing one property generally alters others. Major causes of sand defects are poor grain distribution, improper organic and clay content, and moisture.

Good melting control, Warchol declared, requires knowledge of melting stock composition, good melting practice that produces hot metal. This should be poured fast from clean, dry, well-heated ladles, he advised.

Foundry thinking needs to be introduced at the design stage of a casting, LaForet stated, adding that foundries need to understand machining sequences. Foundries also need to be aware of care required in handling castings that have critical areas and surfaces, he said.

Process variables that affect casting smoothness were reviewed by a panel headed by Prof. C. C. Sigerfoos, MSU. Panelists were: Prof. D. C. Williams, Ohio State University; Earl E. Woodliff, Foundry Sand Service Engineering Co., C. E. McQuiston, Advance Foundry Co., and Mr. Passman, representing Dr. J. A. Ridderhoff, Frederic B. Stevens, Inc. All five are members of the AFS Mold Surface Committee.

Panel members reported the latest penetration studies of the committee in which six blends of sand which would lend themselves particularly well to statistical study were prepared and tested. Work on penetration of gray iron into cores coated with silica flour, crystalline graphite, amorphous graphite, and uncoated was reported.

Chairman and vice-chairman, respectively, for both panels were Kenneth H. Priestley, Vassar Electroloy Products, Inc., and Walter Rebro, MSU.

At the conference banquet, Mr. Van Haver introduced the student paper contest winner, Marvin Van Der Ploeg, MSU, and presented him with a $100 check. The competition, open to all college students in Michigan, was organized by Robert D. Dodge, Archer-Daniels-Midland Co., and Paul W. Olson, Foundry Div., Eaton Mfg. Co.

Prof. L. C. Price greeted conference attendants on behalf of the mechanical engineering department which he heads. AFS President Bruce L. Simpson, National Engineering Co., commented briefly on society activities, pointing out that finances are close to budget, that membership is increasing, and that a new chapter had been added with another in the offing. AFS General Manager Wm. W. Maloney reported that he had looked behind the scenes of conference management and found all running smoothly. He congratulated Van Haver and his committees.

Toastmaster Harry Gravlin introduced D. B. Varner, vice-president of MSU, who told how the land grant college system grew out of Michigan State which was organized in 1855 to serve agricultural education needs. Highest priority is placed today on development of the school's engineering college which started at the turn of the century, he said.

Conference Chairman John Van Haver (left) outlines program for (left to right): Hans J. Heine, AFS technical director; John Grennan, U. of Michigan, retired; AFS President Bruce L. Simpson; MSU Professor C. C. Sigerfoos, conference secretary; and Wm. W. Maloney, AFS general manager.

Well prepared coated sand is more blowable than usual core sand, G. A. Conger, C & S Products Co., said at the first session the second day. Control hot strength of shells by means of bentonite, iron oxide, silica flour, or by adding clay-bearing sand or by varying the resin content, he said.

T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., described pressure molding and the use of the diaphragm molding machine to minimize the problem of achieving two to 10 times normal molding pressures. Advantage, he said, is high mold density with minimum mold wall movement.

Chairman of the session was V. M. Rowell, Harry W. Dietert Co.; co-chairman was Ronald Friedman, MSU.

Quality control means getting closer to what the customer wants, D. E. Krause, Gray Iron Research Institute, said at a second morning session. Customer requirements are more stringent with greater stress on surface cleanliness, machinability, dimensional accuracy, and closer inventory control brought on by increased speed of machining and transfer machines.

Automatic core blowing using five-station units to get 360 cores per hour per unit was described by C. W. Hockman, Cadillac Motor Car Div., General Motors Corp. (*"Automation in Coremaking,"* AMERICAN FOUNDRYMAN, December 1954, pp. 36-40).

Session chairman was Dr. A. J. Smith, head of metallurgical engineering at MSU, with Norman Marine, MSU, as vice-chairman.

At lunch, Hans Heine gave a non-technical talk urging more emphasis on intellectual pursuits and more emphasis on development of thinkers. He was introduced by Herbert F. Scobie, editor of MODERN CASTINGS, who spoke briefly on the magazine and its new format. Response of readers to the Reader Service departments has doubled, he said, pointing out that the magazine was not now only "king size" but also contained 50 per cent more feature material.

Conference Chairman Van Haver presided at the luncheon.

First speaker at the final session was Marvin Van Der Ploeg, paper contest winner, who presented an evaluation of the investment casting process. It is expanding rapidly, he said and is especially advantageous where most casting surfaces are to be used as cast.

Prof. Richard Schneidewind, University of Michigan, described his unreported work on innoculation of iron of malleable composition by injection with special laboratory prepared graphite to get unusually high tensiles.

The conference closed with the showing of the AFS film on "core shooting" and a commentary on the process by Technical Director Heine.

Conference officers were: chairman, John Van Haver; executive secretary, Jess Toth, Harry W. Dietert Co.; secretary, Prof. C. C. Sigerfoos; and Treasurer, Doarde Triponi, MSU instructor.

Committee members included: Program—Fred P. Strieter, Dow Chemical Co., chairman, Dr. A. J. Smith, and Dr. R. A. Flinn; Banquet—Gardner Lloyd, chairman, Fitz Coghlin, Three Rivers Foundry, and Frank Flory, MSU, assistant professor.

Finance—Doarde Triponi, chairman, Prof. Sigerfoos, Frank Buike, Almont Mfg. Co., Henry LaForet, E. J. Passman, and Gerald D. Strong, Battle Creek Foundry Co; Publicity—Fred DeHudy, Centrifugal Foundry Co., chairman, Stanfield Wells, and Harry Gravlin.

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CIRCLE NO. 145, PAGE 69-70

new books

Stainless Iron and Steel—Vol. 2 Microstructure and Constitution.. (3d ed.) J. H. G. Monypenny. F. C. Thompson (ed) xii+330 pp. 173 fig. 43 tables. Chapman & Hall, Ltd. 37 Essex St., London, W. C. 2. England. 1954. 55 shillings.

Deals essentially with metallography of stainless and heat-resisting steels. Written primarily for the metallurgist, the simplest terms have been employed so that others can use it.

Strength of Materials. .(11th ed.) Arthur Morley. x+532 pp. 231 diagrs. Longmans, Green & Co., Inc. 5 Fifth Ave., New York 3. 1954. $4.50.

The 11th edition of a book which first appeared in 1908. Chapters on fatigue, criteria of elastic strength, creep, and metallurgical developments of ferrous metals have been completely rewritten. More information on determinations of elastic deformations.

Deterioration of Materials—Causes and Preventive Techniques . . Glenn A. Greathouse and Carl J. Wessel (ed). xvii+835 pp. Reinhold Pub. Co., 430 Park Ave., New York 22. 1954. $12

Result of collaboration between the Services Technical Committee of the Dept. of Defense and the Prevention of Deterioration Center—National Research Council.

Twenty-four experts have covered, in detail, the climatic, physical. chemical and biological agents of deterioration; materials such as metals, wood, paper, textiles, cordage, leather, plastics and rubber, paints, varnishes, lacquers and enamels; electrical, electronic and other equipment; dehumidification; storage and packaging; and toxicological aspects of preservatives used. Appendices on climatic systems and government specifications. Many illustrations.

Compilation of Chemical Compositions and Rupture Strengths of Super-Strength Alloys . .(ASTM Special Technical Publication No. 170) 8 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. 1955. $0.75

List name, nominal chemical composition, characteristic rupture strengths for rupture in 100 and 1000 hr, and patentee for approximately 100 domestic and 41 foreign alloys. Does not include the conventional ferritic, martensitic, or austenitic stainless steels.

Creep and rupture data are not recommended for design purposes but are included to give an idea of relative strength of the various alloys.

Copper—The Science and Technology of the Metal, its Alloys and Compounds. . ACS Monograph No. 122. Allison Butts, xii+936 pp. Reinhold Publishing Corp., 430 Park Ave., New York 22. 1954. $20.

Forty-six chapters, each written by one or more specialists in the field, cover all important phases of the subject of copper both as a chemical element and as an industrial metal. Chapters on copper-base foundry alloys and casting of copper-base alloys are included. Detailed name and subject indexes. Bibliographies at end of chapters.

The Metal Beryllium. . D. W. White, Jr. and J. E. Burke (editors) ix+703 pp. American Society for Metals, 7301 Euclid Ave., Cleveland 3. 1955. $8.00.

Presents all aspects of beryllium technology including a majority of the papers from the Conference on Beryllium held in 1954 under the auspices of ASM.

The Strain Gage Primer. . C. C. Perry and H. R. Lissner. xi +281 pp. McGraw-Hill Book Co., 330 West 42nd St., New York. 1955. $6.00.

A guide to best methods of using strain gages for accurate results. Covers experimental stress analysis, with emphasis on bonded wire strain gages. Strain gage as a transducer element for instrumenting and controlling mechanical variables is discussed.

Designed to aid everyone interested in the field of stress analysis, the book contains numerous illustrations and tables.

Dictionary of Metallography . . R. T. Rolfe. xii+287 pp. Chemical Publishing Co., Inc. 212 Fifth Ave., New York 10. 1955. $5.75.

A complete up-to-date dictionary with many cross-references and lucid definitions. 1350 terms are defined in the related fields of micrography, macrography, radiography, mechanical and magnetic testing, chemistry, physics, and physical chemistry, as well as metallography.

Industrial Design . . (2d ed.) Harold Van Doren. xiv+379 pp. 289 figs. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. 1954. $6.50.

This non-technical book outlines the principles, techniques and procedures to follow in preparing mass-produced, three-dimensional products for a variety of markets. Design problems covered fall into four main groups: those involving consumer goods; commercial or service equipment; capital or du-

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rable goods; and transportation equipment. Covers all phases of the design field, including history, technique, client, fees, and future. Glossary of design terms at end

Bearing Lubrication Analysis. R. R. Slaymaker. xiv+108 pp. John Wiley & Sons, Inc. 440 Fourth Ave. New York 16. 1955, $5.00.

Deals with sleeve bearings; written primarily for engineering college students whose major interest is machine design and also for the practicing engineer not already familiar with the subject. Includes chapters on Viscosity and Other Properties of Oil; Hydrodynamic Journal Bearings; Sleeve Bearing Design; Bearing Materials, Construction, and Life; Boundary Conditions, the Coefficient of Friction and Oilless Bearings. Lists and defines principal symbols used.

The New American Machinist's Handbook.. Rupert LeGrand (ed.) 1572 pp. McGraw-Hill Book Co., 330 West 42nd St., New York, 1955. $11.00.

Based on earlier editions of *American Machinists' Handbook*, this book contains sections on Machining Methods, Metal-forming Methods, Assembly Methods, Materials, Finishing of Metals, Inspection, Fastening Devices, Tool Engineering and Drafting Practice, Machine-tool Standards, Power-transmission Equipment, and mathematics and Tables. A shop aid for mchinists, designers, draftsmen, and engineers. Over 1000 illustrations.

Applied X-Rays . . (4th ed.) George L. Clark. ix+843 pp. McGraw-Hill Book Co. 330 W. 42nd St., New York 36. 1955. $12.50.

A complete, up-to-date revision, covering the field of applied X-rays. For the metallurgist there are sections dealing with the diffraction studies which yield information. of structures, alloys and textures of metals, together with some mention of radiographic work. Also chapters on crystal chemistry, silicates, and amorphous metals which are closely related to metallurgy.

NANCY PURUCKER, *Librarian*
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foundry trade news

Rockwell Mfg. Co. . . construction starts soon on 100,000 square-foot warehouse, assembly, and repair plant at Porterfield, Calif. Plant is for Rockwell meter and valve products and for warehousing Rockwell-built Delta power tools.

Stauffer Chemical Co. . . ground has been broken for addition to company's research center at Chauncey, N. Y. Adding over 8000 square feet of chemical laboratory and office floor space, the addition will cost more than $250,000.

Baldwin-Lima-Hamilton Corp... will cast eight 14,500 pound, five-bladed propellors for U. S. Navy vessels being built by Ingalls Shipbuilding. The 12½ foot diameter wheels will be cast of Nialite, B-L-H alloy.

O. Z. Electrical Mfg. Co., Inc... has joined Non-Ferrous Founders' Society.

R. Hoe & Co... 150-year old printing press manufacturer has formed contract manufacturing organization and will seek jobbing work for their 60 ton ,per day gray iron foundry and pattern shop at Dunellen, N.J.

Stratos Division.. Fairchild Engine & Airplane Co. division has joined Investment Casting Institute.

Lynchburg Foundry Co... has published company history. Copies available by writing Lynchburg, Va.

Louis E. Wolfson.. has taken up 60,000 shares of Scullin Steel Co., St. Louis steel foundry. Scullin makes railroad car parts and armor tank castings. Plant has 5,500 ton a month capacity.

Central Foundry Co... has announced $2,000,000 mechanization and expansion for Holt, Ala., plant. Company has spent $7,500,000 for improvements in recent years.

Kaiser Aluminum & Chemical Corp... will rush completion of basic refractory brick plant at Columbiana, Ohio to meet demand of steel mills.

National Malleable and Steel Castings Co... announced net sales of $42,853,258 in first nine months of 1955 which compares with $27,494,-562 for the period in 1954.

Hettleman & Sons, Inc... Baltimore firm has joined American Foundrymen's Society. Emanuel Hettleman is vice-president of firm.

Carbide & Carbon Chemical Co... has joined Investment Casting Institute.

Lone Star Steel Co... announced net income before taxes for third quarter of 1955 of $2,478,992.

Montrose Chemical Co... Newark, N.J., firm has joined Investment Casting Institute.

Easton Car & Construction Co... has named Lee H. Long Associates, Inc. and E. D. Farrell Co., Inc. as sales agents.

Geo. B. Smith Chemical Works Inc... has doubled production of sulphur free chromium oxide at Maple Park, Illinois plant.

National Dust Collector Corp... Chicago firm has joined Foundry Equipment Manufacturers Association.

California Doran Heat Treating Co... Los Angeles firm will increase capacity 40 per cent to become largest in the west.

Great Lakes Carbon Corp... has elected Walter Gramm chairman of the board.

Prescott Co... Menominee, Michigan foundry has joined American Foundrymen's Society. George A. Salisbury is foundry manager.

Anderson Brass Co... Detroit brass founder has acquired certain assets of brass division of Detroit Brass and Malleable Co. to form a new company, the Detroit Valve Co.

Mechanical Handling Systems.. Detroit firm has joined Foundry Equipment Manufacturers Association.

Basic Refractories, Inc... has reorganized operations in Ohio. Changes involve **A. M. Caito** who is moved to post of manager of Ohio operations; **E. P. Pearson** now assistant technical director; and **Vaughn V. Hughey** who becomes director of research at company's Bettsville labs.

Colorado Fuel and Iron Corp... announced that a special meeting of board of directors has reelected all officers.

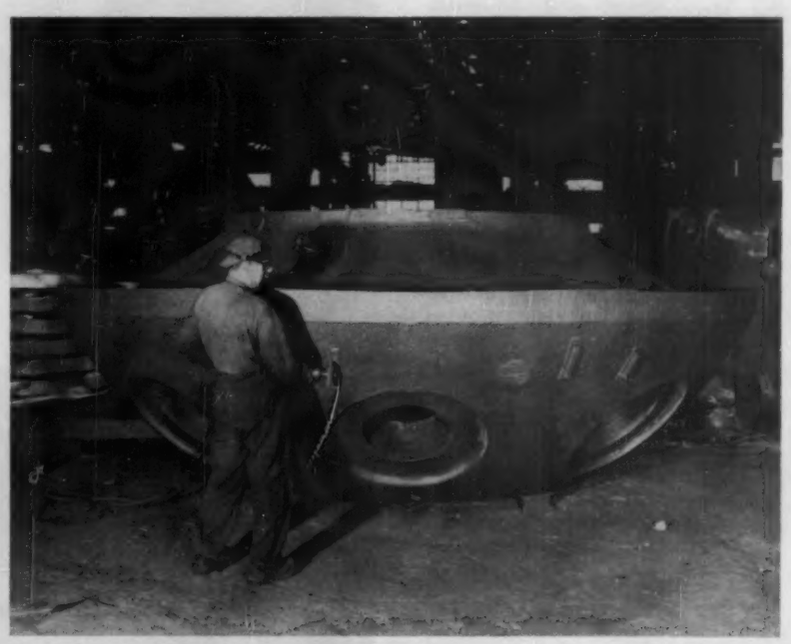
National Lead Co... has declared a dividend of $1.10 per share on the common stock.

Catalytic Combustion Corp... Detroit firm has joined Foundry Equipment Manufacturers Association.

Guilford Foundry Co... Greensboro, N.C., plant has joined American Foundrymen's Society. P. B. Kicks is plant superintendent.

American Steel Foundries.. have moved general offiices to the Prudential Plaza, Chicago 1, Chicago Loop's newest skyscraper.

Accurate Die Casting Co... has added 23,500 square feet of production area. Space included 4,000 feet



Largest steel casting ever made in Canada is this 125,000 pound hydro runner hub for the power project at Niagara Falls. 190,000 pounds of metal were poured to make casting in Canadian Car & Foundry Co. shops.

for production of magnesium die castings and 11,000 feet for production of aluminum die castings.

Accurate Die Casting Co.

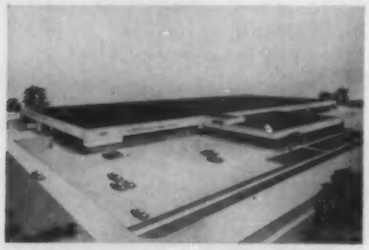
Slinger Foundry Co... 300-foot wing of Slinger, Wis., plant burned November 17. Owners M. O. and William Holtan estimate "terrific loss."

Lithium Corp. of America.. will expand electrolytic plant at St. Louis Park, Minneapolis suburb.

Graver Water Conditioning Co... has established a sales-service office in Detroit.

Huron Mfg. Co... formerly Master Pattern Co., Cleveland, has moved to Huron, Ohio, where it will be operated under its new name by the same president, Vincent J. Sedlon.

Dean Precision Casting Co... Minneapolis firm has joined Investment Casting Institute.



Oster Manufacturing Co.

Oster Manufacturing Co... has moved into its new plant in Wickliffe, Ohio.

Magnesium Elecktron, Inc... is new name of **Melberk, Inc.** Firm's address in now Rockefeller Center, New York 20.

Lawrence Laboratory.. Santa Monica, Calif., firm has joined Investment Casting Institute.

ELECTROMET Supplies the Iron Foundry with Alloys for all Purposes

ELECTROMET offers you ladle or cupola addition agents for any of your foundry needs. Additions of ferro-alloys will adjust the composition of the base iron to make it suitable for the particular work on hand. You can reduce chill in thin-sectioned castings or improve strength and machinability. You can, if desired, increase hardness and improve resistance to wear and heat—all through simple additions of alloys. There is a wide variety of ELECTROMET alloys from which to choose.

ELECTROMET not only has the alloys to meet your needs, but also furnishes technical assistance in their use. Please phone or write the ELECTROMET office nearest you for detailed information on these or other ELECTROMET products.

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Ferrosilicons (50%, 75%, 85%, and 90%) In grades and sizes suitable for all conditions in the iron foundry. Silicon reduces chill in thin-section gray iron castings.

"SMZ" Alloy — A strong, super-graphitizing alloy and chill reducer. Contains zirconium and manganese to enhance the inoculating properties.

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Zirconium Alloys (12 to 15% and 35 to 40%) Graphitizers for reducing chill, aiding machinability, and improving tensile properties.

Ferrochromium Alloys — Available in many grades for cast iron. All grades have rapid solubility. Widely used to improve the hardness, strength, and heat and wear resistance of cast iron.

Ferrovanadium — ELECTROMET foundry grade ferrovanadium has good solubility. Vanadium improves toughness.

FOR CUPOLA ADDITIONS

"EM" Briquets—For adding chromium, manganese, silicon or zirconium to cast iron. "EM" briquets are scientifically designed for maximum alloy recovery in cupola melting.

local foundry news

now there are 43!

Install Connecticut Chapter

First chairman of the new Connecticut Chapter of the American Foundrymen's Society, Don Sawtelle, Malleable Iron Fittings Co. (third from right) received congratulations from C. E. Brust, Eastern Malleable Iron Co., AFS national director. In the installation scene are (left to right): A. B. Steck, General Electric Co., AFS General Manager Wm. W. Maloney, Mr. Brust, AFS National Director Harold L. Ullrich, Mr. Sawtelle, Hugh Pope, Eastern Malleable Iron Co., chapter secretary, and Fred C. Irving, Aluminum Co. of America, treasurer of the group.

■ Now there are 43 industrial chapters in the American Foundrymen's Society.

Latest addition came when the Connecticut Chapter was installed November 22 at Waverly Inn, Chesire, Conn. Installation became official when Don Sawtelle, Malleable Iron Fittings Co., received the beribboned cast rattle symbolic of new chapterhood from AFS General Manager Wm. W. Maloney. Assisting in the ceremony were C. E. Brust, Eastern Malleable Iron Co., and Harold L. Ullrich, both national directors of AFS.

Slate of officers submitted by the Nominating Committee, in addition to Chapter Chairman Sawtelle, included: vice-chairman, Arthur E. Row, Producto Machine Co.; secretary, Hugh Pope, Eastern Malleable Iron Co.; treasurer, Fred C. Irving, Aluminum Co. of America.

Directors, one-year term: D. Wesley Case, Belknap Mfg. Co., James E. Chafey, Chase Brass & Copper Co., Inc., Gordon B. Mannweiler, Eastern Malleable Iron Co.

Directors, two-year term: Roderick R. Washburn, Plainville Casting Co., Robert J. Brandt, Pennsylvania Foundry Supply Co., G. L. Richter, Farrell Birmingham Co.

Directors, three-year term; Clayton D. Berry, Hartford Electric Steel Corp., Frank B. Diana, Frank B. Diana Co., James Baxter, Malleable Iron Fittings Co.

Nominating Committee members were: Myron H. Gould, Aluminum Co. of America, chairman, Paul V. Johnson, Eastern Malleable Iron Co., William J. Sommer, Plainville Casting Co., and Thomas F. Peppe, Hartford Electric Steel Corp.

Following installation of the new chapter and its officers, A. B. Steck, General Electric Co., described his experience with the CO_2-water glass process for hardening cores and molds.

Organization of the Connecticut Chapter, with territory embracing the entire state, took place at a meeting in Chesire September 20. Following this the Steering Committee petitioned the AFS Board of Directors for official recognition as a chapter and approval was granted shortly thereafter.

Steering Committee members who petitioned on behalf of the current and potential membership of AFS in Connecticut Chapter territory were: Don Sawtelle, chairman, C. E. Brust, J. J. Healey, Producto Machine Co., R. R. Washburn, Hugh Pope, and Thomas F. Pepe, Hartford Electric Steel Co.

Timberline

William J. White, Shallway Co., Connellsville, Pa., spoke on *"Shell Molding"* at the November 14 meeting of the Timberline Chapter in the Oxford Hotel, Denver. Because shell molding is a comparatively new subject to Denver foundrymen, all attending were enthusiastic, and a spirited question and answer period followed.—*A. D. Neal, U. S. Foundries, Inc.*

Canton District

The November 3 meeting of the Canton District Chapter of AFS was held at the Elks Club, Barberton, Ohio.

Prof. Richard A. Flinn, University of Michigan, spoke on *"Ductile Iron."* In his talk he described the engineering properties of various types of ductile iron as well as the manufacturing processes and some of the problems encountered and their solutions in producing this material on a production basis.—*R. R. Kozinski, Canton Malleable Iron Co.*

Mo-Kan

Hans J. Heine, technical director, American Foundrymen's Society, spoke on *"New Horizons in the Foundry Industry"* at the November 16 meeting of the Mo-Kan Chapter held at the Fairfax Airport, Kansas City, Kan.—*Ianer Munck, Fairbanks Morse & Co.*

Metropolitan

John South, Foundry Services, Inc., Columbus, Ohio, was the speaker at the November 7 meeting of the Metropolitan Chapter at the Essex House, Newark, N. J.

"The Co_2 Method for Making Cores" was highlighted by a core-making demonstration and a new AFS movie on the method.

Mr. South stated that over-gassing a core, while it will make a stronger core, will tend to give a gradually weaker core as the core stands. However, cold sand will cause gassing time to be increased considerably. The sand should be approximately room temperature.

Mr. South emphasized that the sand must be as free from moisture as possible, because as little as ¼ per cent can weaken a core over a period of days. As little as ¼ per

Oregon . . O. C. Bueg addresses November meeting.

cent clay can also weaken a core as it stands. The tensile strength should come to about 80 psi immediately after gassing and increase to roughly 110 after several days.—*Herman C. Kretz, Cooper Alloy Corp.*

Oregon

O. C. Bueg, Shell Casting Co., Inc., Erie, Pa., addressed members and guests of the Oregon Chapter of AFS November 16 at the Heathman Hotel, Portland.

He used slides showing type of patterns and pattern material, gating practice, shell molding equipment and heating elements to illustrate his talk, *"Shell Molding Patterns."* He said that castings are now being produced without fins and in weights and dimensions not previously believed possible.

Mr. Bueg's entire talk was based on the fact that the pattern maker is in a good position to help foundrymen make better castings and should work closely with the foundry to produce better castings at a lower price. By cooperating, the patternmaker and foundryman can operate to their mutual benefit.—*Bill Walkins, Electric Steel Foundry.*

Central Illinois

Seventy members of the University of Illinois Student Chapter were guests at the Annual Students'

Detroit . . C. A. Sanders, American Colloid Co. addressing the chapter on November 17. Looking on is John Nabrezny, vice-chairman of the chapter.

Joints serving hot lines

...or how Chuck Wright handles cracks when the heat's on

"Drexel Foundry had a hunk of trouble with expansion joints they poured for the Phoenix plant," said Chuck. "Even though they met Phoenix specs, the castings kept cracking in lines handling process liquids. One joint, in service about six months, simply went to pieces," he added. "Al Hipp of Drexel then called me to come over.

"Test bars showed that Al used a mix meeting specs for iron of 35,000 psi. No mistake, either. The lab book showed it as room temperature strength. Furthermore, Drexel's foundry practices were tops.

"So my question was, 'Al, what temperatures must a joint handle?'

"Rummaging through a ream of Phoenix letters, he answered, *'Gases from 650° to 800°F.'*

"Now, a strength of 35,000 psi at room temperatures falls to 28,000 psi in the 650° to 800°F range. For safety, it should be higher than 35,000 to start with.

"Replacement castings...now in the Phoenix pipe line for many months...contain 1½% nickel. Their good service shows that a *little* nickel gives iron a *lot* of additional strength, toughness and hardness.

"What some fellows may *not* know, is that nickel also slows down deterioration. Nickel irons retain a high proportion of their original properties despite heat.

"Like a good sailor, always know where you're going. Don't trust to luck where the metallurgy of castings is involved. Call on me when you want some practical help. Easiest way to reach me is through INCO."

Chuck Wright

The International Nickel Company, Inc. INCO

67 Wall Street New York 5, N. Y.

CIRCLE NO. 147, PAGE 69-70

Night meeting of the Central Illinois Chapter on November 7 at the American Legion Hall, Peoria.

Bill Huelsen, technical chairman for the evening, introduced the speaker, Hans J. Heine, technical director of American Foundrymen's Society. Mr. Heine's topic, *"Gating Design for Improved Casting Quality,"* was supplemented by a color movie, "Effect of Gating Design on Casting Quality." The film, a result of AFS sponsored research, gave the 190 persons in attendance an insight into procedures found to be good practice for horizontal gating.—*H. L. Marlatt, Galva Foundry Co.*

Reading Foundrymen's Association

At the November 15 meeting of the Reading Foundrymen's Association at the Berkshire Hotel, Reading, William J. White, Shallway Corp., Connellsville, Pa., spoke on *"Shell Molding & Shell Cores."*—*W. E. Cassidy, Secretary.*

Wisconsin

Wisconsin chapter of American Foundrymen's Society met in Milwaukee November 11 to hear four technical topics discussed. The first of the four talks was *"Sealing Coreboxes for Blowing,"* a talk presented to gray iron founders and pattern makers by Richard L. Olson, Dike-O-Seal, Inc.

Olson described the construction and use of continuous dike-type seal core boxes. Such equipment, he said will produce cores of consistent permeability while eliminating patching, mudding and expensive brass and steel facings. H. Wesley Stokes, Kilbourn Pattern Co., Inc., and Jim Burke, Wisconsin Gray Iron Fdry. Co., were technical chairman for this session.

Development of shell molding in the mid-west was described by John R. Nieman, Shell Process, Inc., as part of *"Shell Molding for Profit in the Small Foundry,"* Nieman's private census of molding equipment showed the number of automatic shell molding machines located in mid-western shops, excluding auto plants, growing from two experimental machines in January 1951 to a minimum of 47 by the beginning of 1956. Chairmen of this session were Walter Puzach and E. H. Jagmin, Jr., both of Ampco Metal, Inc.

A history of the use and development of core additives was presented by Jos. A. Gitzen, Delta Oil Products Co., in his talk, "New vs *Old Core Room Practices.*" Chairmen for this session were Paul Hiemenz, Falk Corp., and Richard Koch, Wehr Steel Co.

Michigan State University Student Chapter . . Jess Toth, Harry W. Dietert Co., giving details on the Michigan Regional Foundry Conference.

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Johns-Manville TRANSITE CORE PLATES AND SLIP JACKETS

CIRCLE NO. 148, PAGE 69-70

Tennessee . . Some of the members and guests at the October 21 meeting are, standing, left to right: A. J. Fruchtl, Thomas Barr & Associates; and William Hamilton, Crane Co. Seated, left to right: John Lasater, Combustion Eng., Inc.; Herman Bohr, Robbins & Bohr; C. V. Nass, Beardsley & Piper Div.; and W. B. Greiser, Ross-Meehan Foundries.

University of Alabama Student Chapter . . At the October meeting are, from left to right: R. E. Rybka, Acipco; G. A. Gorham, chairman of U. of A. Chapter; W. W. McCulloch, Acipco; Dr. Adalbert Wittmoser, guest speaker from Germany; and E. C. Wright, head of the metallurgical engineering department.

Over-mechanization was one of the problems discussed by L. G. Probst, National Engineering Co., in his talk, *"Foundry Layouts and Maintenance."* Probst stated that one department in a plant should be mechanized at one time and that the supervision should be familiar with the system before it is used.

Chairmen of the session were C. A. Gutenkunst III and William R. Kerner, both of Milwaukee Malleable & Grey Iron Works.

Cincinnati District

The October meeting of the Cincinnati District Chapter of AFS held at the Anthony Wayne Hotel, Hamilton, Ohio, was attended by 105 members and guests.

Edward King, Hill & Griffith Co., chairman of the FEF Industry Advisory Committee at the University of Cincinnati, presented AFS junior memberships to five FEF Scholarship students attending the school.

Zigmond Madacey, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago, spoke on *"Tricks In Core Blowing."* He outlined the important properties required of the core sand mixture to insure successful blowing of cores, and methods of adapting core boxes for a wide variety of sizes and shapes of cores for efficient core blowing were illustrated with slides.—R. R. Deas, Jr., Hamilton Foundry & Machine Co.

Cincinnati District . . Pictured at the recent FEF Scholarship Meeting are, back row, left to right: R. J. Westendorf, vice-chairman of the chapter; William Tholke, instructor, University of Cincinnati; Ed King, chairman of the FEF Industry Advisory Committee at the U. of C.; Fred Westerman, professor of metallurgy, U. of C.; and J. D. Sheley, chairman of the chapter. Front row, left to righ: FEF Scholarship students at the Universiy of Cincinnati, J. T. Gavin, D. M. Kohler, and R. G. Wilson.

University of Alabama Chapter

Dr. Adalbert Wittmoser from Germany was the honored guest speaker at the October meeting of the University of Alabama Student Chapter. His topic was *"The Development of Foundry Practices and Foundry Operations in Germany."*—*R. R. Phillips, Secy.-Treas.*

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CIRCLE NO. 149, PAGE 69-70

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CIRCLE No. 150, PAGE 69-70

afs chapter meetings

JANUARY

3 . . Chicago . . Chicago Bar Association, Chicago. Management Night. James H. Smith, Central Foundry Div., General Motors Corp., *"Recent Foundry Developments."*

4 . . Toledo . . Toledo Yacht Club, Toledo, Ohio. J. G. Winget, Reda Pump Co., *"Melting Iron in Reverberatory Type Furnace."*

5 . . Saginaw Valley . . Fisher's Hotel, Frankenmuth, Mich. National Officers Night. Hans J. Heine, *"AFS Research Activities."*

5 . . Canton District . . Canton, Ohio. A. J. Dublo, Sterling Foundry Co., *"The Cupola."*

6 . . Western New York . . William J. White, Shallway Corp., *"Shell Core Making."*

9 . . Central Indiana . . Athenaeum Turners, Indianapolis. John E. Gotheridge, Foundry Services, Inc., *"CO_2 Process."*

9 . . Michiana . . Club Normandy, Mishawaka, Ind. A. F. Pfeiffer, Allis-Chalmers Mfg. Co., *"Coordinative Function of Pattern Equipment and Castings."*

9 . . Metropolitan . . Essex House Hotel, Newark, N. J. J. M. Crockett, Air Reduction Sales Co., *"Injection Methods for Gray Iron."*

9 . . Central Illinois . . Legion Hull, Peoria. Harold C. Weimer, Beardsley & Piper Div., Pettibone-Mulliken Corp., *"Mechanization for the Small Foundry."*

9 . . Cincinnati District . . Cincinnati Club, Cincinnati. Panel Discussion on *"Control and Testing of Foundry Materials."* Sand—William R. Oakley, Delhi Foundry Sand Co.; Clay—Chuck Loucks, Eastern Clay Products; Metals Larry Balch, Chapel Testing Laboratories, Inc.; Core Oil—Nick Miraldi, Dayton Oil Co.

10 . . Rochester . . Hotel Seneca, Rochester, N. Y. Local Talent Night (composed of local chapter members).

10 . . Twin City . . Covered Wagon,

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- Applications in Molding Practice
- Pouring Practice
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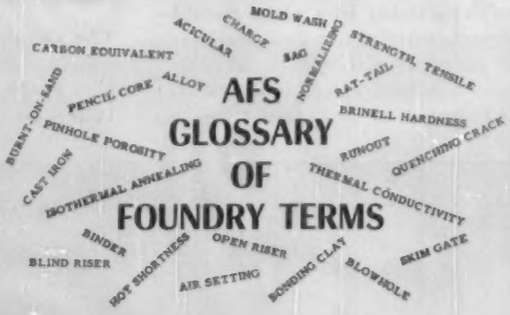

Including almost 2000 terms, this book is intended to help standardize the meanings of foundry terms throughout the metal castings industry. In its preparation, reference was made to many presently existing glossaries and dictionaries of scientific and engineering terms. IT IS THE MOST COMPLETE WORK OF ITS KIND and should be at the fingertips of every member of the metal castings industry. *(80 pp. 6 x 9 Paper Bound.)*

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12 . . Northeastern Ohio . . Tudor Arms Hotel, Cleveland. Charles Walton, technical director, Gray Iron Founders' Society, *"Principles of Risering."*

13 . . Philadelphia . . Engineers Club, Philadelphia. J. W. Estes and G. E. Spangler, Air Reduction Research Laboratories, *"Ladle Injection by Gas Carrier."*

13 . . Central New York . . Onondaga Hotel, Syracuse. Hans J. Heine, technical director, American Foundrymen's Society. *"New Horizons in Foundry Progress."*

13 . . Southern California . . Rodger Young Auditorium. Los Angeles. C. W. Vokac, Whiting Corp., *"Electric Furnace Melting."*

18 . . Oregon . . Heathman Hotel, Portland. C. W. Vokac, Whiting Corp., *"Electric Furnace Melting."*

20 . . Ontario . . Royal York Hotel, Toronto. Panel discussion with J. Bell, Aluminum Co., Canada; L. G. Day, Light Alloys Ltd.; W. Jones, Canadian Westinghouse. AFS film, *"Vertical Gating."*

20. . British Columbia . . P. A. Club, Vancouver. C. W. Vokac, Whiting Corp., *"Electric Furnace Melting."*

20 . . Birmingham District . . Tutwiler Hotel, Birmingham, Ala. H. W. Schwengel, Modern Equipment Co., *"New Developments in Melting Equipment."*

20 . . Texas . . White Plaza Hotel, Dallas. Howard H. Wilder, Vanadium Corp. of America, *"Cupola Practice."*

21 . . Chesapeake . . The Alcazar, Baltimore, Md. Annual Oyster Party.

27 . . Chesapeake . . Engineers Club, Baltimore, Md. T. C. DeMond, editor, Materials and Methods Magazine, *"What's New in Engineering Materials."*

27 . . Tennessee . . Hotel Patten, Chattanooga. E. J. Jory, Lester B. Knight & Associates, Inc., *"CO_2 Sand Bonding."*

FEBRUARY

2 . . Saginaw Valley . . Fischer's Hotel. Frankenmuth, Mich. Annual Ladies Night.

2 . . Canton District . . Elks Club, Barberton, Ohio. W. A. Hambley, Chas. A. Krause Milling Co., *"Scrap—Whose."*

6 . . Metropolitan . . Essex House, Newark, N. J. Round Table Meeting on Gating of Castings. Steel—K. V. Wheeler, Alloy Steel Products Corp.; Cast Iron—R. Rischer, Ingersoll-Rand Co.; Non-Ferrous—D. L. La Velle, Federated Metals Div.

6 . . Central Illinois . . Legion Hall, Peoria. *"Know Your Area Foundry."* A representative from each foundry in Central Illinois area is invited to give a description of his foundry and its products.

6 . . Central Indiana . . Athenaeum Turners, Indianapolis. B. H. Taylor, *lenge in Human Relations."*

7 . . Chicago . . Chicago Bar Association. Round Table Meting. Malleable & Non-Ferrous Div.—AFS movie on *"Study of Fluid Flow Through* B. F. Goodrich Co., *"Todays Chal-Vertical Gating System"*; Gray Iron & Maintenance Div.—E. J. Jory, Lester B. Knight & Assoc., Inc., *"Progressive Mechanization on a Small Budget"*; Pattern Div.—David Kindt, Kindt Collins Co., *"Research in Pattern Coatings"*; Steel Div.—Dr. D. E. Smith, Harnischfeger Corp., *"Welding Rods and Machines."*

7 . . Rochester . . Chamber of Commerce, Rochester, N. Y. Joint meeting with the American Society for Metals.

9 . . Northeastern Ohio . . Pattern Makers' Night.

10 . . Philadelphia . . Engineers' Club, Philadelphia. William G. Gude, managing editor, Foundry, *"Castings Market."*

10 . . Central New York . . Onondaga Hotel, Syracuse. Eastman Kodak Co. representative, *"Non-Destrictive Testing."*

13 . . Michiana . . Club Normandy, Mishawaka, Ind. J. H. Smith, Central Foundries Div., General Motors Corp., *"Future of the Foundry Industry."*

24 . . Chesapeake . . Engineers Club, Baltimore, Md. Bernard Ames, Doran Manganese Bronze Co.

24 . . Tennessee . . Patten Hotel, Chattanooga Tenn. Harry H. Kessler, Sorbo-Mat Process Engineers, *"Gating and Risering."*

3000-lb induction air melting furnace pours a heat for ingot castings. Equipment flexibility is indicated by a vacuum melting installation that handles heats to 2000 lb or low temperature anneals of titanium.

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■ On a 540-acre tract, about 40 miles east of Pittsburgh, Westinghouse Corp. has built what is believed to be the largest metals processing pilot plant in the country.

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Manufacturing sizable quantities of a new product usually reveals problems, often statistical, sometimes basic, that won't come to light by any other method. Meeting production schedules proves the commercial practicability of newly developed processes. Also, the demonstration of processes actually in small-scale producton facilitates their transfer to a supplier's plant by minimizing his risk of encountering extensive manufacturing problems.

The 173,000 sq ft, $7,500,000 facility brings together under one roof equipment for shell moldng and investment casting, powder metallurgy, forging, hot and cold rollng, and heat treating.

Operating presently with a force of 270, of whom 50 per cent are technical and service personnel, the integrated development and production of special alloys and special castings will ultimately employ nearly 500.

Major progress from pilot plant operations is expected in the near future in the fields of high temperature materals, hard and soft magnetc materials, expansion alloys, special foundry and powder metal processes, and nuclear fuel element manufacturing techniques.

Emphasis will be focused on simplifying and automating recent advances in foundry techniques of investment and shell mold casting so that they can be incorporated in manufacturing lines with the same ease as machining operations. This should ultimately lead to decentralzing the company's foundries.

Manager of the Blairsville Pilot Plant is Warren Trigg. Superintendent of castings manufacture is C. H. Wilson.

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MOLD CONVEYOR:
Webb Co. heavy duty 356', 109 cars 32" x 39"

BELT CONVEYORS:
Flat Belt—20", 24", 30", 36"
Troughing—3—24" x 22', 1—24" x 350'

BUCKET CONVEYORS:
2—40', 3—50', 8" x 16" buckets

MOLDING MACHINES:
Rollover, Pin-Lifts, Squeezers, etc.
Makes: Champion, Davenport, Herman, International, Johnson & Jennings, Milwaukee, Nichols, Osborn, Spo and Tabor.

AIR COMPRESSOR:
Ingersoll-Rand 800 CFM, 150 H.P. 220/3/60

OVERHEAD CRANES:
1—3 ton Bedford—40' span, 220/440/3/60, 120' runway.
1—3 ton Shepard—Monorail 25 H.P., 550v. D.C.
1—Chisholm-Moore Cupola Charging—200' runway.

GLENVILLE 1-1222
CLEVELAND, OHIO

WE CARRY ALL MAKES AND TYPES OF FOUNDRY EQUIPMENT IN STOCK
SEND FOR OUR COMPLETE LISTING NO: 156

GUARANTEED USED FOUNDRY EQUIPMENT

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classified advertising

For Sale, Help Wanted, Personals, Engineering Sevice, etc.,
set solid . . 2Ûc per word, 30 words ($6.00) minimum, prepaid.

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. . Based on per-column width, per inch . . 1-time, $15.00; 3-time, $13.50 per insertion; 6-time, $12.50 per insertion; 12-time, $12.00 per insertion; prepaid.

HELP WANTED

METALLURGIST Technically trained with malleable experience for well estabished progressive, jobbing and semi-production foundry in middlewest employing 150 men. Capable of supervising batch type air furnace melting, annealing and laboratories. Submit application including personal data, resume of qualifications and experience, references and salary expected. **Box C96 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

TECHNICAL SALES REPRESENTATIVE Young man, college trained; some foundry experience preferred. This is a salaried position in the Chicago area with a national company in foundry materials. Excellent opportunity for aggressive, personable man. Limited travel; car and expense; outstanding employee benefit program. **Send resume to Box C99 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

MOLDING FOREMAN for Eastern Non-Ferrous Jobbing Foundry specializing in Bronze Alloys and Aluminum. Either salary or substantial hourly rate. One who can take a job and see it through to completion with minimum effort. Write giving personal history, references and salary or rate desired. Our own men know of this advertisement. **Box C95 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

Southern California Opportunity for Technical Sales Engineer. Rapidly expanding stainless steel and high alloy foundry providing quality castings to aircraft and related industries, seeks highly qualified men age 30-45, with outstanding sales ability. Foundry or metallurgical background required. Write, giving complete details, to **Box C94 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

MANUFACTURERS AGENTS to sell grey iron castings in northern Illinois, Chicago, and southern Wisconsin. Uniformly high quality and machinable. Standard commission paid promptly. **Box C93 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY ENGINEERS—DRAFTSMEN. Experienced. Send brief outline of training and experience with recent photo. **Box C98 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY ASSISTANT needed by captive gray iron foundry of medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S. E. Penna. Reply **Box C65, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

We want several live-wire salesmen who are now working on salary and who think that they could increase their earnings by selling on liberal commission. These men must have followings in industries buying master alloys and hardeners. Please give full details in your first letter, i.e., personal history, employment record, territory, etc. Your information will be held in strictest confidence. **Box C70, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

ENGINEERS. Immediate openings for high caliber men with degrees in mechanical engineering, industrial or management engineering, metallurgy, civil engineering and physics, at salaries ranging from $4345.00 to $8990.00, to perform vital work in connection with the design and development of ordnance materiel. **Mr. R. F. Donohue (Albany or Troy-Extension 2201) Civilian Personnel Officer, Watervliet Arsenal, Watervliet, New York.**

ASSISTANT TO FOUNDRY SUPERINTENDENT in modern foundry located in Western New York state, pouring iron, bronze, aluminum in small to medium castings and having pattern shop for wood and metal patterns. State experience, age and salary desired. **Box C88 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

WANTED
Production Supervisor

Exceptional opportunity for permanent position responsible DIRECTLY TO THE PRESIDENT for man under 40 with good education and experience in mass production especially of medium sized forgings, hardening and finishing, and to set up and operate production control and cost in modern progressing plant with friendly atmosphere. Apply in confidence with full information to:

Ernest Estwing, ESTWING MFG. CO., ROCKFORD, ILLINOIS

REPRESENTATIVES WANTED

SEVERAL EXCLUSIVE TERRITORIES for aggressive organizations now calling on foundries, all types. No supply houses wanted unless you offer capable equipment engineering and service. Nationally advertised, well known line includes shell molding equipment, core blowers, core draw machines, combination blower and draw machines, molding machines, miscellaneous foundry equipment, custom-building and testing equipment. Liberal commissions. **Box C91 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

POSITIONS WANTED

FOUNDRY METALLURGIST. University Education, highly specialized in Shell Molding of Aluminum, Bronzes, Iron and Steel, accustomed to full control, wishes to join firm to establish or develop S.M. foundry. Sound knowledge of economics of process and ideas for development. For resume and details write **Box C97 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

ENGINEERING SERVICE

EARL E. WOODLIFF,
Foundry Sand Engineer.
Consulting . . . Testing.
14611 Fenkell (5-Mile Rd.)
Detroit 27, Mich.
Res. Phone Vermont 5-8724

SESSIONS ENGINEERING CO.
Consulting Foundry Engineers
Modernization, Processing Layouts
Cost Reduction Quality Control
Product—Machine Design
Architectural Design
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FOR SALE

FURNACES FOR SALE

10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.

BAER STEEL PRODUCTS, INC.
Box 1428
Boise, Idaho

AFS chapters

continued from page 78

The latest AFS research film, *"Study of Fluid Flow of Light Alloys Through Vertical Gating Systems,"* was shown at the luncheon and constituted the final technical feature of the conference. Conference Chairman White presided at the luncheon; toastmaster was Lloyd Wright who was also conference vice-chairman.

Other conference officials were: from Syracuse—Bruce R. Artz, Jr., Pangborn Corp, secretary; General Arrangements Committee co-chairman, Ralph J. Denton, R. J. Denton Co., and William D. Dunn, Oberdorfer; N. W. Meloon, Jr., Meloon Bronze Foundry, Inc., was Membership and Reception Committee chairman; treasurer was George P. Stanton, Jr., Stanton Foundries, Inc., Solvay.

Chapter representatives were: Donald C. Brainard, Dayton Oil Co., Syracuse—Central New York; Bailey D. Herrington, Hickman-Williams, Erie—Northwestern Pennsylvania; Joseph M. Clifford, Atlas Steel Casting Co., Buffalo—Western New York; Duncan M. Wilson, Engineered Castings Div., American Brake Shoe Co.,—Rochester; R. W. MacArthur, Ramsey Chain Co., Inc., Albany—Eastern New York; F. W. Kellam, Electro Metallurgical, Welland,—Ontario; and Claude C. Bourassa, Archer-Daniels-Midland Co., Ltd., Montreal, Que.—Eastern Canada.

Besides Chairman Ochsner, the program committee consisted of: Syracuse men—William Mader and Harold Brakeman; from Buffalo—Edmund J. Burke, Hanna Furnace Corp.; chapter representative Clifford; and Edward E. Hook, Dayton Oil; from Rochester—Max T. Ganzauge, General Railway Signal Co.; and Edward J. Baker, Federated Metals; also Donald Merwin, Oriskany Malleable, Oriskany, N. Y.; chapter representative Kellam; and William Bryce, International Harvester, Hamilton, Ontario.

EMPIRE
"THAT GOOD"
FOUNDRY COKE
DEBARDELEBEN COAL CORPORATION
2201 First Ave., North Birmingham 3, Ala.
Phone 3-9135

CIRCLE NO. 151, PAGE 69-70

STANDARD
does it again!

The KOOLHEAD 90°

The 90° bend under the head simplifies your operation and places the chill where it belongs. The "Koolhead 90°" will perform two duties: (1) a chill and (2) holding the sand on the surface of the mold. We feature clean, bright finished Horse Nails and can furnish the new bent head in any of the various "Koolhead" types.

Write for samples and prices.

CHILL KOOLHEAD NAILS

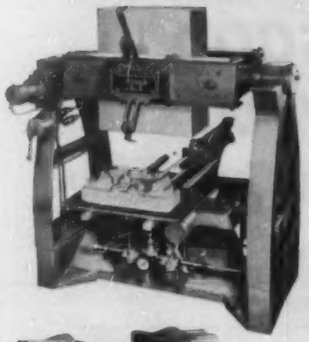
STANDARD HORSE NAIL CORP.
Since 1872
NEW BRIGHTON, PA

CIRCLE NO. 152, PAGE 69-70

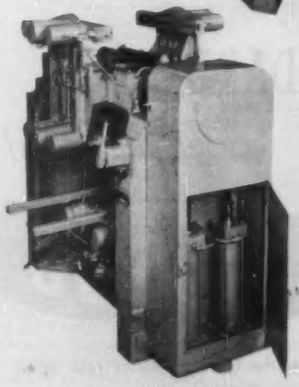
BOOST CORE OUTPUT UP TO 400%

. . . stabilize quality, too!

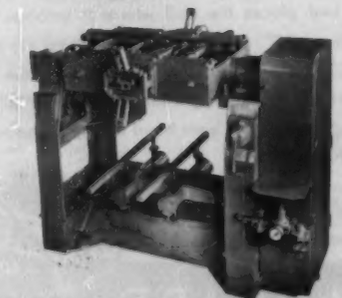
3 BASIC MODELS



Automatic Double Rollover Core Draw Machine. Shown with automatic pushout device (optional equipment), (Model No. SP-2020), which positions the drawn cores for easier removal. Pushout device and elevator mechanism available for all Sutter Core Draw Machines.



Automatic Double Rollover Core Draw Machine with side draw backs. Model SP-541. Cycle—approximately 20 seconds. Maximum Core box size 26" long x 13" wide x 10" deep.



Automatic Double Rollover Machine for heavy duty operation. Operating cycle is 6 seconds minimum. Available in three standard sizes.

SUTTER

CORE DRAW MACHINES

Because they provide completely automatic cycle, Sutter Core Draw Machines boost production from 300% to 400% and provide absolutely uniform high quality since the human element is entirely removed from the draw operation.

All the operator need do is to place the core dryer and, while the cycle continues automatically, remove the core drawn from the previous cycle. The dryer is clamped, the box rolled over and the core is drawn without any attention from the operator.

Because of the simplicity of operation, peak production can be maintained easily by unskilled operators. When used in conjunction with a blower, the operator can perform both the blow and draw operations with ease.

In addition to three standard models, each in a variety of sizes, Sutter also designs and builds special units to suit unusual needs. Our engineers will be delighted to discuss your operations and point up the savings these versatile machines will provide to you. Just write or wire today for technical bulletins.

SUTTER

SUTTER PRODUCTS CO.

2005 WESTWOOD AVE. • DEARBORN, MICH.

Canadian and Overseas Mfr. & Dist'r. • **FOUNDRY EQUIPMENT LIMITED** • **Leighton Buzzard, Bedfordshire, England**

CIRCLE No. 111, PAGE 69-70

continued from page 79

Reecemelt to the production of quality castings. Structure, uniformity, machinability, and wear resistance are detailed. Reecemelt is defined and process advantages are listed. *Reecemelt*

CIRCLE No. 88, PAGE 69-70

Shell Molding Manual

28-page, GE Shell Molding Manual covers description, advantages, comparison with overlapping processes, fundamental steps, trouble shooting hints, application studies, testing methods and procedures, shell molding service offered to foundrymen, partial list of equipment suppliers. *General Electric Co.*

CIRCLE No. 89, PAGE 69-70

Snagging Grinders

It is pointed out in Form 3547 that customary grinders in snagging operations lose money in discarding worn grinding wheels which could be used if the grinder were a Standard Infinitely Variable Speed machine. Many before and after photos show applications of Standards and about 75 users are listed. *Foundry Grinder Div., Standard Electric Tool Co.*

CIRCLE No. 90, PAGE 69-70

Casting in Glass Molds

Glascast Process described in Bulletin GC-1 is a fast, economical method especially designed for casting high temperature alloys in glass molds. It provides excellent surface finish and the tight dimensional control required in precision casting. Because molds can be used at extremely high temperatures, design of fine detail and close regulation of metallurgical structure is possible. *Corning Glass Works.*

CIRCLE No. 91, PAGE 69-70

Standard Conversion Tables

16-page, pocket-sized reference F7255 gives thermocouple temperature-millivolt equivalents. Temperatures on 1948 International Temperature Scale, electromotive force in absolute units. *Wheelco Instruments Div., Barber-Colman Co.*

CIRCLE No. 92, PAGE 69-70

Industrial Lighting

"More Light for Less Money" describes 16 mercury vapor lamps and their specifications and applications; answers questions about mercury vapor lamps. *Sylvania Electric Prod.*

CIRCLE No. 93, PAGE 69-70

obituaries

J. Carl Bode, 53, president of National Carbide Co., a division of Air Reduction Co., Inc., died November 11 at the Manhasset Medical Hospital in Manhasset, New York.

Earl C. Petrie, 52, director of research, North American Refractories Co., Cleveland, passed away November 2. He joined the company in 1940 and had been director of research since May. Before coming with North American Refractories Co., he received a refractories fellowship at Mellon Institute, Pittsburgh, and was graduated from Ohio State University.

Martin A. Fisher, 70, executive vice-president and treasurer, Standard Buffalo Foundry, Inc., Buffalo, passed away October 25. He was a member of the executive board of the Inter-Allied Foundries of Erie County, Buffalo, and a director of the Gray Iron Founders' Society in 1941-42.

John G. Malnoski, until recently president of Muncie Malleable Foundry Co., Muncie, Ind., passed away October 2. He was active in the Malleable Founders' Society of which he was a former director.

John H. Schuler, 60, sales manager, Albany Casting Co., Voorheesville, N. Y., passed away October 30. Before joining Albany Casting Co. he was a vice-president of Jewell Steel & Malleable Co., Buffalo.

More information on any of the products and services advertised as listed in MODERN CASTINGS can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 69-70.

A NEW AND DIFFERENT FAST DRYING MOLD SPRAY

Now with *Stevens Ignicoat* you can eliminate long torch drying of molds. You can eliminate drying ovens. Yes, with Stevens Ignicoat the expense, maintenance and fuel of tunnel ovens or banks of drying torches is no longer necessary.

Ignicoat, the new and different mold spray for the foundry, is a graphite coating, so formulated that it is easier to handle out of the drum and easier to mix than either a powder or a paste. And it is not dusty. It can be sprayed, brushed or swabbed. It produces a smooth casting surface and greatly aids peel of sand from castings.

Ignicoat mixes rapidly with isopropyl alcohol and contains the proper percentage of binder to insure good film adherence to the sand.

When it is sprayed on a green sand mold in the proper amount, it will show both penetration and surface coverage. After being ignited it will burn, with a gentle flame, from 10 to 40 seconds, depending on the amount used. Molds may then be closed and poured. The coating will not draw moisture.

Send for a trial order today. Write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN

FREDERIC B. STEVENS INCORPORATED
EVERYTHING FOR A FOUNDRY

CIRCLE NO. 112, PAGE 69-70

FOUNDRY SAVES $32,040 IN ONE YEAR WITH WHITING-THERMO HOT BLAST SYSTEM!

Here is proof that the Whiting-Thermo Hot Blast System makes *big* savings! The following figures show dollar results obtained from an actual installation, accurately measured and controlled:

	BEFORE HOT BLAST	AFTER WHITING-THERMO HOT BLAST
Cost of metal charge	$42.57 per net ton	$42.43 per net ton
Coke	4.55	2.95
Flux	.67	.28
Gas fuel for blast preheater	(none)	.20
Misc. charges		.15
TOTAL	$47.79	$46.01

SAVINGS per net ton **$1.78**
SAVINGS (72 ton/250 days) per year **$32,040.00**

The Whiting-Thermo Hot Blast System employs a separate fired air heater, precisely controls air blast temperatures up to 1000°F. and makes available almost instant pre-heated air. Large savings in coke, silicon and fluxing agents are provided. The lining does not burn out over nearly as high an area as with cold blast—thus patching costs are reduced about 50%. Melting rates can be increased 10% to 15%, using the same diameter lining. Analysis is more uniform—fewer casting rejects. There is a reduction in oxidation of silicon and less sulphur pick up.

Send for complete information on Whiting-Thermo Hot Blast Systems today!

WHITING CORPORATION
15628 Lathrop Avenue, Harvey, Illinois

WRITE FOR REPORT CONTAINING IMPORTANT INFORMATION ON HOT BLAST.
Ask for Bulletin FO-3

WHITING
FOUNDRY EQUIPMENT

modern castings

CIRCLE NO. 110, PAGE 69-70